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PLANT VARIETY PROTECTION ACT

HEARINGS

BEFORE THE

SUBCOMMITTEE ON AGRICULTURAL RESEARCH
AND GENERAL LEGISLATION

OF THE

COMMITTEE ON AGRICULTURE,
NUTRITION, AND FORESTRY

UNITED STATES SENATE

NINETY-SIXTH CONGRESS

SECOND SESSION

ON

S. 23

A BILL TO AMEND THE PLANT VARIETY PROTECTION ACT (7 U.S.C. 2321 ET SEQ.) TO CLARIFY ITS PROVISIONS, AND FOR OTHER PURPOSES,

S. 1580

A BILL TO AMEND THE PLANT VARIETY PROTECTION ACT TO CLARIFY ITS PROVISIONS,

AND

S. 2820

A BILL TO AMEND THE PLANT VARIETY PROTECTION ACT TO CLARIFY ITS PROVISIONS, AND FOR OTHER PURPOSES

JUNE 17 AND 18, 1980

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PLANT VARIETY PROTECTION ACT

TUESDAY, JUNE 17, 1980

U.S. SENATE,
SUBCOMMITTEE ON AGRICULTURAL RESEARCH
AND GENERAL LEGISLATION OF THE
COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY,
Washington, D.C.

The subcommittee met, pursuant to notice, at 9:16 a.m., in room 324, Russell Senate Office Building, Hon. Donald W. Stewart (chairman of the subcommittee) presiding.

Present: Senator Stewart.

STATEMENT OF HON. DONALD W. STEWART, A U.S. SENATOR FROM ALABAMA

Senator STEWART. This morning the Subcommittee on Agricultural Research and General Legislation will receive testimony on three bills, S. 23, S. 1580, and S. 2820.[1] These bills would amend the Plant Variety Protection Act enacted in December 1970. It is designed to encourage the development of new varieties of sexually reproduced plants.

By the act, a patent-like certificate is provided the breeder of new varieties for a 17-year period. Amendments to the act are being considered today which would include six vegetables specifically deleted in the original act, and alter provisions of the act so as to be in accordance with the international union for the protection of new varieties of plants.

Though the Department of Agriculture supports these amendments, as do many sectors of the agricultural research community, there has been vocal opposition to the patenting process and to these amendments. Many of those opposing the amendments, as I understand it, are here to testify today. Some of the most often repeated concerns expressed by those in opposition to the bill are that the patenting process encourages the loss of some genetic material, that the patenting process has encouraged the acquisition of seed companies by larger corporations, and that there is a need to look at the rising cost of seed in its relation to the patenting process.

The hearing today is on the bills which would amend the original act. Being new to this area, I look forward to the examination of these many issues related to the plant patenting process. Intimately related to the creation of new plant varieties is the collection and storage of our genetic heritage in the form of germplasm.

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[1] See p. 195 for reprints of S. 23, S. 1580, and S. 2820, with accompanying staff explanations.

I am concerned about the germplasm preservation effort by the Department of Agriculture, and that is an understatement. I have asked the Department to provide to the committee a status report on the program and its facilities. I intend to hold hearings on this important subject later in the summer, and would perhaps hold this bill until we can get some kind of amendatory language into the legislation that would strengthen our efforts as a department and from the congressional standpoint in that area. I will wait to see what testimony is presented to determine what we would do in that area.

We have a varied group of witnesses today which should provide the committee with a full range of opinion on the Plant Variety Protection Act amendments. I look forward with an open mind to hearing from each of them and expanding my knowledge on plant patenting and the process, and perhaps imparting a little knowledge of my own.

And due to the length of the witness list, I ask that each witness summarize his testimony, if possible, in 10 minutes or less. And if you can do better than that, I would appreciate it because I have got some questions I'd like to ask.

Barbara, do you want to begin to testify.

STATEMENT OF BARBARA SCHLEI, ADMINISTRATOR, AGRICULTURAL MARKETING SERVICE, U.S. DEPARTMENT OF AGRICULTURE; ACCOMPANIED BY BERNARD LEESE, COMMISSIONER, PLANT VARIETY PROTECTION OFFICE, AND DR. QUENTIN JONES, SCIENCE AND EDUCATION ADMINISTRATION

Ms. SCHLEI. Thank you, Mr. Chairman. We appreciate the opportunity to appear before your committee to present the Department's views on legislation to amend the Plant Variety Protection Act.[1]

My name is Barbara Schlei. I am the Administrator of the Agricultural Marketing Service. Accompanying me today are Bernard Leese, Commissioner, Plant Variety Protection Office and Dr. Quentin Jones, Science and Education Administration.

The Plant Variety Protection Act enacted in 1970 as the chairman stated, provides patent like protection to breeders who develop or discover distinct new plant varieties which are produced by seeds. We grant certificates of protection to breeders based on novelty, stability, and uniformity within the variety.

Participation in the plant variety protection program is voluntary. A breeder must apply for protection. We keep the application process simple. A farmer can do it by himself. And we try to keep the process inexpensive to encourage participation by individuals, small farmers and small seed companies. The Government has no enforcement responsibilities. There is no regulatory scheme. Enforcement of a breeder's rights is that particular breeder's responsibility utilizing the civil law procedures.

Several issues have been raised in opposition to the bill. First, that plants are becoming extinct, that we are losing our genetic diversity, that we are failing to adequately preserve our germplasm. This is a very real concern, Mr. Chairman. We have been told, some 200 plant species have become extinct annually. Numerous varieties are in danger this year.

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[1] See p. 71 for the prepared statement of Ms. Schlei and p. 74 for the prepared statement of Dr. Jones.

These issues have serious implications for the world food supply. Since most major crops were bred from native or wild plants, as native lands breeds vanish, breeders may lose the potential of these materials for fortifying today's crops and breeding future crops. Consequently, there is a greater demand on fewer genetic parents, making the resulting crops more vulnerable to epidemics.

We must take adequate steps to preserve our genetic material. Because of the critical importance of plant germplasm to our agriculture, the Science and Education Administration of USDA has commenced a study of the entire national plant germplasm system to assess its strengths and weaknesses, and to determine how the latter can best be corrected.

Senator **Stewart**. When did this study start?

Ms. **Schlei**. Mr. Chairman, I do not know the date on which the study was commenced. It is due to be completed in late August of 1980.

Senator **Stewart**. Does anyone here know when it started?

Dr. **Jones**. It started in January of this year.

Senator **Stewart**. How long has the Agriculture Department been aware that this is a problem?

Ms. **Schlei**. Mr. Chairman, I think that the Department has been concerned about this problem, certainly, for the 3 years that I have been with the Department, and has been actively engaged in an effort to collect this material for our germplasm bank in Fort Collins. That is a facility which SEA maintains and in which we actively, collect, store, and classify germplasm.

Senator **Stewart**. What major event or occurrence prompted the study in January?

Ms. **Schlei**. I am advised by Dr. Jones, who is here as a representative of SEA, that there was no major event that caused that study. The work has been continuously undertaken by SEA. In preparation for the budget, AMS together with SEA, began to ascertain what additional work would be needed to complete the cataloging of the seeds that are presently being stored in Fort Collins, in addition to the numerous storage facilities that we already have throughout the country. There are a great number of private as well as public storage facilities that have important reserves of plant germplasm.

Senator **Stewart**. You indicated to me, in the first part of your testimony, that this was a very serious matter, that it had potential for threatening the capabilities of this country and other countries to produce food in the future. You said this was a continuing study. But this study you are referring to now, of a more formal nature, I assume, was started in January of this year. How long have you all been aware of the problems, the extinction of the various plant varieties, the difficulties that that might cause? How long have you all been aware of that?

Ms. **Schlei**. Mr. Chairman, my understanding is that this problem first became of concern to the Department of Agriculture in the early 1950's.

Senator **Stewart**. How many studies have you had since that time?

Ms. **Schlei**. We would be happy to ascertain that information and submit it for the record.

[The following information was subsequently received by the committee:]

No studies have been made to determine the number of varieties that have become extinct over the years. It is impossible to determine how many of the heirloom varieties are located in world collections, national collections, university collections, or private collections. Until the Plant Variety Protection Office was established, we in the United States had no formal way to register or identify new varieties of plants that were placed in channels of commerce. Usually the only descriptions of the varieties were seed descriptions geared to sell the varieties. Now the Plant Variety Protection Office requires that all protected varieties have a full description registered with us and that a viable seed sample be maintained in the National Seed Storage Laboratory for the 17 years that the plant variety is protected.

Senator **Stewart**. Give me some general idea.

Ms. **Schlei**. In the 1950's, there started to be an active collection of germplasm, and that germplasm bank has continued to be actively developed to the present time.

In addition, there is the importance, not just of collecting the germplasm, but also having it properly classified and cataloged so that we can adequately retrieve the samples that we presently have in storage.

Senator **Stewart**. How much money do you devote to that each year?

Ms. **Schlei**. Mr. Chairman, the USDA-SEA germplasm research system including maintenance, currently has a budget of about $7 to $8 million a year. We will get that figure precisely for you and put it in the record.

Senator **Stewart**. Please do.

[The following information was subsequently received by the committee:]

The Department was appropriated funds for germplasm research in fiscal year 1980 of $8.7 million, and in fiscal year 1981 of $9.7 million. In addition, the annual budget provides approximately $300,000 for the germplasm maintenance system.

Ms. **Schlei**. However, the specific program that I had reference to was the need to properly classify and catalog what we have. It is like a great library, and it is useless if we do not have it cataloged in a useful way, not only what is in Fort Collins, but what is in all of the private laboratories throughout the country.

Senator **Stewart**. When did you start doing that?

Ms. **Schlei**. That work was started 3 years ago, sir, and it has a budget of about one-half million dollars a year. It is that work to which I had reference.

Senator **Stewart**. Is that adequate?

Ms. **Schlei**. Again, sir, I think that that problem would be more appropriately addressed to Dr. Bertrand, who is the Administrator of SEA. But I think that the Department is seriously concerned about the adequacy of that work. The Department is actively involved in reviewing the concerns about the loss of germplasm and inadequate genetic diversity, and will advise the Congress and the public on programs and policies to deal with these issues.

Senator **Stewart**. When was the first time you did that?

The program started in the 1950's. You have been aware of the difficulties that might be experienced since that time. You started a study in January. You have got a $500,000 a year appropriation for a cataloging system, $7 to $8 million to run the program.

It is my understanding that the facilities at Fort Collins are inadequate. When did you ring the alarm bell to Congress in such a way that they would recognize that, and do something about it?

Ms. **Schlei**. Mr. Chairman, I know that this work continues to be of enormous concern to the Department. It is, as I stated, the responsibility of the Science and Education Administration under the direction of Dr. Bertrand. And I hesitate to speak for him on this issue. Dr. Quentin Jones is here as a representative of the Science and Education Administration. I know that he will be happy to address that concern with you, sir.

Senator **Stewart**. So that the record is complete, so that we have that information, for the purposes of my own information and for others on the committee who might not be aware of this particular matter, why do we not let him tell us when we first heard from the Agriculture Department about this problem, and the potential magnitude of the problem, and what the Agricultural Department would suggest that Congress do about it?

Ms. **Schlei**. Thank you, Mr. Chairman. We would very much appreciate the opportunity for Dr. Jones to address that issue.

Let me say, however, as the Administrator of the Agricultural Marketing Service, which is in charge of the Plant Variety Protection Act, that I know of Dr. Bertrand's personal concern for this issue. I have, on numerous occasions, discussed the importance of this issue with him over a 2-year period, and I know that he is vitally concerned, as we are in the Agricultural Marketing Service.

Dr. **Jones**. Mr. Chairman, I am Quentin Jones of the Science and Education Administration, USDA. I have been involved in the germplasm program since 1956. I would like to, if I might, clear up a few things here.

We probably have the best germplasm system in the world, without doubt. The United States has been in this position since the beginning, in that most of our—essentially, all of our major crops are native to other places in the world. So we have had to pay special attention to bringing in genetic material for improving our crop species.

It became quite evident following——

Senator **Stewart**. May I ask you a question?

Dr. **Jones**. Yes, sir.

Senator **Stewart**. You just said you all have got a tremendous system. Why did you start this study in January?

Dr. **Jones**. If I may, this is what I am bringing us up to on this study.

Senator **Stewart**. Well, let us just short circuit something.

Dr. **Jones**. All right.

Senator **Stewart**. If you have got a good system, if it is adequately operating, then why did we start the cataloging system—I assume, Ms. Schlei said, what, 3 years ago?

Dr. **Jones**. It is not, by any means, a disaster. We are doing a great deal toward rescuing germplasm in various parts of the world through plant exploration.

Senator **Stewart**. How many naturalists do you have on your staff who are involved in plant exploration?

Dr. Jones. We do not maintain people just for that role. We use people in the State experiment stations, from universities, and from our own staff, to do exploration work.

Senator Stewart. How many do you fund or finance?

Dr. Jones. We send out, now, on the average of five or six explorations per year. Now, about 80 percent of our germplasm comes in through exchange with other countries that do not require direct exploration for the material. But I want to assure you that we need to do more of this. And I am not sitting here saying that, everything is up to where it should be.

That is the reason for the study, so we can pick up, do a better job on this. But we have in the order of one half million accessions——

Senator Stewart. What recommendations would you make?

Dr. Jones. Would I make?

Senator Stewart. Yes; that you would do to improve your capabilities in that area?

Dr. Jones. Well, there is quite a bit we need to do. We need to, first——

Senator Stewart. Just give me some specific examples.

Dr. Jones. All right.

Senator Stewart. What you would do to improve the Agriculture Department's program in this particular area?

Dr. Jones. We need to get our information system implemented. It will be in 2 or 3 years, at the present level of funding. We need to do a lot more on evaluating the germplasm that we have so that we know the genetic characteristics that are in those collections. This will give us a much better intelligence for collecting from the wild. And we need to study the material that is in the wild so we can identify what is out there that we do not have, so that we can intelligently fill some gaps.

This is going to, obviously, require more resources than we have now.

Senator Stewart. How much——

Dr. Jones. I guess I would be preempting this study by injecting my personal view.

Senator Stewart. I wondered why you had to do the study. How much is it going to cost?

Dr. Jones. We have been through several reorganizations in the last few years. This, in itself, has brought on some problems.

Senator Stewart. You mean reorganization within your particular department or reorganizations within the agency in general?

Dr. Jones. Within what was the Agricultural Research Service, with the SEA, and so on. There are some managerial connections that need to be improved.

Senator Stewart. Well, what does that have to do—what specifically would it have to do with this particular item?

Dr. Jones. It is a part of the implementation of policy at the national level so that the advice of the advisory committees that we work with is carried out throughout the system.

Senator Stewart. What makes up your advisory committees? Do you mean private individuals involved in that?

Dr. Jones. We have a National Plant Germplasm Committee that is made up of Federal, State, and private sector people. It meets, on the average, twice a year, and looks at the whole system of what we are doing.

Senator Stewart. Can you give me a list of those people who are on that advisory committee?

Dr. Jones. We have the——

Senator Stewart. I do not want you to give it now, but give it for the record.

Dr. Jones. I would be glad to; yes.

Senator Stewart. Just provide it.

[The following information was received by the committee:]

Members of the National Plant Germplasm Committee (NPGC)

Administrative Advisors (SAES)

Dr. Robert W. Hougas, Associate Dean and Director, College of Agricultural and Life Sciences, University of Wisconsin, Madison, Wisconsin 53706.

Dr. Curtis R. Jackson, Director, State Agricultural Experiment Station, Experiment, Georgia 30212.

Dr. D. W. Barton, Director, State Agricultural Experiment Station, Geneva, New York 14456.

Dr. W. H. Foote, Associate Director, Agricultural Experiment Station, Oregon State University, Corvallis, Oregon 97331.

National Council of Commercial Plant Breeders

Dr. William L. Brown, Pioneer Hi-Bred, International, 1206 Mulberry Street, Des Moines, Iowa 50308.

Science and Education Adminsitration, USDA Cooperative Research

Dr. C. I. Harris, Deputy Administrator, CSRS, Room 424-A, Admin. Bldg., U.S. Department of Agriculture, Washington, D.C. 20250.

Agricultural Research

Dr. Quentin Jones, Plant Introduction and Narcotics, USDA, AR, National Program Staff, Beltsville, Maryland 20705.

Dr. Norman James, Sugar Crops, USDA, AR, National Program Staff, Beltsville, Maryland 20705.

Dr. S. M. Dietz, Regional Plant Introduction Station, USDA, AR, Western Region, State Agricultural Experiment Station, Pullman, Washington 99164.

Dr. D. D. Dolan, Regional Plant Introduction Station, USDA, AR, Northeastern Region, Room 201 Sturtevant Hall, State Agricultural Experiment Station, Geneva, New York 14456.

Dr. Gilbert R. Lovell, Regional Plant Introduction Station, USDA, AR, Southern Region, State Agricultural Experiment Station, Experiment, Georgia 30212.

Dr. W. H. Skrdla, Regional Plant Introduction Station, USDA, AR, North Central Region, Iowa State University, Ames, Iowa 50010.

Dr. George A. White, Germplasm Resources Laboratory, USDA, AR, Northeastern Region, Beltsville, Maryland 20705.

Senator Stewart. And you say you follow somewhat their directions?

Dr. Jones. Pardon?

Senator Stewart. You follow somewhat their directions, is that correct?

Dr. Jones. They are the policymaking group on our germplasm system, and they recommend to the Federal and State system what should be done to——

Senator Stewart. Can you give me the private—are you aware of the private individuals who are involved in that advisory business? Could you give me those?

Dr. Jones. Yes.

Senator Stewart. Can you give me those now?

Dr. Jones. I will give you the complete committee.

Senator **Stewart**. Just the private individuals is what I want, just their names, now. Can you give them to me right now?

Dr. **Jones**. The private member right now of that committee is Dr. W. L. Brown, of Pioneer Hi-Bred International.

Senator **Stewart**. What is that, now, the Pioneer Hi-Bred International?

Dr. **Jones**. It is one of the large seed companies.

Senator **Stewart**. How large are we talking about, as far as seed companies?

Dr. **Jones**. I guess—I do not know specifically, that it is probably, if not the largest, one of the top several.

[The following information was subsequently received by the committee:]

Based on Dun and Bradstreet, Pioneer Hi-Bred International employs 1,600 people and seed production is their major endeavor. (Dr. Harold Loden expanded on the activities of Pioneer Hi-Bred International in his testimony.)

Senator **Stewart**. What do they do other than develop seed?

Dr. **Jones**. They, of course, are heavily involved in breeding new varieties.

Senator **Stewart**. Any other types of activities they are involved in?

Dr. **Jones**. They maintain germplasm for their breeding programs.

Senator **Stewart**. And they are just involved in the production of seed, is that right? That particular entity?

Dr. **Jones**. That is their main enterprise, yes.

Senator **Stewart**. They do not do anything else in the way of enterprise?

Dr. **Jones**. Not to my knowledge, but I am not that familiar with their operations.

Senator **Stewart**. Does anybody at the table know?

Ms. **Schlei**. Mr. Chairman, Mr. Harold Loden is with us today. He is the executive secretary of the American Seed Trade Association. I think that he would be prepared to describe the——

Senator **Stewart**. Well, maybe he can illuminate a particular item in your remarks. You are going to testify?

Ms. **Schlei**. Yes. But I think that the relevant fact is that Pioneer is one of the seven largest seed companies in the United States. It is not, however, a member of any conglomerate. It is a public company and involved in producing seed.

Senator **Stewart**. I did not accuse them of being involved in any conglomerate at all. I asked if they were involved in any other enterprise. I did not say they were in a conglomerate. I just wanted to know who the private member is.

Are there any other private members?

Dr. **Jones**. No.

Senator **Stewart**. Within the State——

Dr. **Jones**. This is a 13-member committee, 4 are regional advisors from the State experiment station system, and there are 4 regional coordinators in charge of our regional plant introduction stations.

Senator **Stewart**. Did they suggest this study?

Dr. **Jones**. Pardon me?

Senator **Stewart**. Did they suggest this study?

Dr. **Jones**. Dr. Bertrand, Director of SEA, Science and Education Administration, asked this committee to undertake the study; yes.

Senator **Stewart**. In an effort to beef up our capabilities?

Dr. **Jones**. That is right.

Senator **Stewart**. Have there been any requests for increased appropriations from either this authorizing committee here in the Senate, the one in the House, the Appropriations Committee over here, or by the Department of Agriculture to take care of this problem?

Dr. **Jones**. We have gotten some new appropriations in recent years for germplasm.

Senator **Stewart**. Did you ask for more than you got this year?

Dr. **Jones**. I would say that this is true of most years.

Senator **Stewart**. You may proceed with your testimony, Barbara. And what I would like to do, if you possibly could, is allow you to testify to about 10 o'clock when I have got to go over and open the Senate. I will not be more than 15 minutes and I will be back. If you could go ahead.

Ms. **Schlei**. Thank you, Mr. Chairman. In concluding this section of my testimony, let me say that I think you have properly focused on a very significant and important issue. The Department is concerned about this issue, I think that the Congress is properly concerned with this issue. I believe that Mr. Fowler and the other public interest groups that have so actively raised this issue before both the Senate and the House have performed an important public service. This is an important issue for us to identify and come to grips with.

However, I do not believe that the bill, in any way, is inconsistent with the need to preserve our genetic diversity. Indeed, the Plant Variety Protection Act has assisted the Department in the collection and classification process. The Plant Variety Protection Office has developed a computer system for identifying plant characteristics. Published descriptions of previously released varieties from all parts of the world are now transferred to the computer for storage. We have a quick retrieval system and we have a system for comparison. We now have in excess of 15,000 plant variety descriptions which are stored on that computer.

This computerized system is attracting worldwide attention because it is less costly, more rapid, more objective, and will preserve the variety of descriptions in a standardized format for posterity. Australia, Canada, Japan and New Zealand plan to duplicate our system. Argentina, Brazil, and other South American countries are also interested in the system.

Not only do we have a complete description of the genetic resources contained in these new varieties, but also the seeds of these varieties are stored and maintained in our National Seed Storage Laboratory in Fort Collins, Colo.

But, important as it is to preserve genetic materials at centers like Fort Collins, we cannot expect or want our farmers to return to low-yield varieties.

Automobiles have replaced the horse and buggy, electricity has replaced candles, tractors have replaced the plow. I think that some of us may wake up in the morning and wish that we could return to Walden Pond. But I cannot reverse that process. I do not think we want to reverse that process. We cannot return to planting low-yield native varieties. Our agriculture is the most productive sector of our economy, and the most productive agriculture in the world.

And to keep it the most productive, to face the needs of millions of people in this world to be fed, we have to continue our research base. We have to continue to produce and develop higher yielding varieties so that we can increase the food supply of the world.

Senator STEWART. Let me see if I understand what you are saying there, now, because it seems to contradict what you said in the original part of your statement.

You indicated we would have a problem of great magnitude if we did not maintain these original varieties and strains. Now you are indicating that if we do not continue the kind of effort that has been made, that some are concerned that would cause us to lose that original genetic matter; that we are also going to have a problem of great magnitude—you are not saying it is an either/or proposition, are you?

Ms. SCHLEI. Exactly correct, Mr. Chairman.

Senator STEWART. Does not one effect the other? Are you saying there is no connection in the process? Would not one effect another?

Ms. SCHLEI. There is a connection, Mr. Chairman, but they are not an either/or proposition, as you suggest. We can preserve our genetic base through proper collection and proper classification of that collection, and storage in Fort Collins. And at the same time we can go forward with our important research work to increase the productivity of our agriculture and to increase the yields of our farmers.

Senator STEWART. I can see that. But to say that they are not related—what if we get—let us just take a hypothetical. What if we gave the control of the process of the increased yields, new varieties, and everything, to some large-size folks? And what if we put a piddling little amount of money, a very small amount of money, in the process of saving those older strains, and really did not pay attention to that until January 1980, when we developed a study that would ring the alarm bells for Congress?

Do you see any connection there, any reason for anybody to have any concern?

Ms. SCHLEI. Mr. Chairman, I think the subject is of great concern, but I do not think that that is what has occurred.

Senator STEWART. You do not?

Ms. SCHLEI. No, sir. First of all, I think that the research to develop new varieties has not been placed in anybody's hands. This is a free enterprise system in which each and every farmer and each and every seed company in the private sector has and can be actively involved in research. In addition to that, the Government has been actively involved in research.

Senator STEWART. I understand that. I am sure they have.

Ms. SCHLEI. On the other hand, sir, it is important that we continue to preserve and increase our work in the preservation of germplasm. This work has been undertaken by the Department continuously since 1950.

I think that the Chairman is correct in pointing out that the work can be and should be more vigorously undertaken than it has been in the past. I think that Mr. Fowler and the other public interest groups have served an important and valuable function.

Senator STEWART. I am not talking about Mr. Fowler here, and the other public interest groups, although they might have raised that question. I am talking about what I feel, as a member of the U.S. Senate, about the evidence that you have presented to me so far. That is what I had in mind.

And I am talking about the evidence that I am slowly but surely assimilating as people begin to talk to me about this particular piece of legislation. And I am impressed with what you say Mr. Fowler has done, but I have not heard from that.

All I am talking about is what I am concerned about. And right now that is all I care about.

Ms. SCHLEI. Thank you. Mr. Chairman, the point that I wish to make is that, while I believe that you are correct in your concern about the importance of preserving genetic material, I do not believe that the amendments, before your committee are in any way inconsistent with that effort. On the contrary, I think they are consistent with that effort——

Senator STEWART. You may be right.

Ms. SCHLEI. And helpful to that effort, and, in fact, it has resulted in the classification to date, in the 10 years in which the legislation has been in existence, of 15,000 varieties with a seed bank representing the seeds of those 15,000 varieties.

A second objection to the amendment seems to be a basic opposition to the patent law, itself. That is, I think, a legal and philosophical issue on which reasonable people can differ.

Senator STEWART. Barbara, if you do not mind, I am going to go and open the Senate, because I was asked to do so by Mr. Byrd. I will be back and listen to the rest of this testimony, because I want you to educate me on your bill, and I want you to educate me on the problem, because after I get educated, I am going to try to educate the committee, and then we will try to educate the Senate. And we are going to try to help you all.

Ms. SCHLEI. Thank you, Mr. Chairman. We appreciate the opportunity to appear before you.

[Whereupon, a short recess was taken.]

Senator STEWART. On the record.

Do you want to proceed with your testimony?

Ms. SCHLEI. Thank you, Mr. Chairman.

Senator STEWART. You were at the point where you were saying the second objection to this particular legislation was the philosophical one about the patents process.

Ms. SCHLEI. Yes, sir. I think that this second objection is directed more at the overall concept of legal rights for breeders of plant varieties than at the legislation which is pending before Congress.

Patents have served this country well for over 200 years. Major efforts to improve the patent system have been recommended by the administration as well as numerous other bills proposed by Congress.

But the underlying philosophy of the patent law has served us well. We need a research base to increase our agricultural productivity and enhance the economy of the country. I do not believe that all research should be left to the Government. I believe that research should be largely done by the private sector.

But under our form of government, if we want the free enterprise system to undertake research, there must be an economic incentive. A patent provides the opportunity for a farmer to recoup the venture capital which goes into that research. Plant breeding requires unusually painstaking research. Plant explorers travel around the world to locate germplasm that is especially hardy, productive, disease-resistant, or exceptional in other ways to meet society's needs. To develop one new variety, breeders make hundreds of crosses and raise thousands of seedlings for evaluation, a process that usually requires 7 or more years to produce a marketable result.

Senator STEWART. Well, then, Barbara, are we really talking about a little old farmer out there making those kinds of investments? Does that actually occur?

Ms. SCHLEI. Yes, sir, it does occur, and it occurs in very large numbers.

Senator STEWART. Could you give me some idea of what those numbers—the reason I ask that question, I was in Montgomery for about 8 years, and there was a fellow who always used to stand up on the floor and say that, "I am here representing those little old pulp wooders down in my part of the State." I would always go along with him. I would vote for whatever proposal he had because I had a concern for the little pulp wooders in his part of the State and my part of the State. And I found out that the little old pulp wooders he was representing were International Paper Co., Scott Paper Co., and I got a little concerned after that.

So if you have got some facts and figures that indicate how many people do get involved in this process, and how they are protected, I would like for you to share them with us for the record.

Ms. SCHLEI. Mr. Chairman, the Plant Variety Protection Office, since its inception in 1970, has received a total of 1,140 applications for 70 distinct crops, and has issued 707 certificates of protection. Some, like the sugar snap peas, have become popular with home farmers and gardeners. A total of 89 applications were received from foreign countries, 131 were received from experiment stations, and 920 from private breeders in the United States.

Only 278 or 24.4 percent, of the applications were received from the seven large seed companies.

Senator STEWART. So then you have got, out of that number that we are providing, a little around 75 percent, a little over 75 percent, that were small type seed producers, is that correct?

Ms. SCHLEI. That is correct, sir, and experiment stations.

Senator STEWART. Now, what percentage of the remaining 75 would be allocated to experiment stations?

Ms. SCHLEI. Mr. Chairman, that would be 10 percent of the total, so it would be about 7.5 percent of the remaining 75 percent.

Senator STEWART. So a little over a half of that group would be new type seed producers? Are these folks who have been around for a long period of time, or are they new folks who have come into being as a result, not totally, but as a result, perhaps, of this patenting process?

Ms. SCHLEI. I do not have accurate figures on that, Mr. Chairman, but we could try to ascertain that and submit it for the record.

Senator STEWART. I see Mr. Leese is giving you something, there. Do you want to comment, sir, about that?

Mr. LEESE. Yes. This is a question that I addressed recently. Of those 1,140 applicants, 52 applicants have presented one application, 37 applicants have presented two applications; 15, three; 14, four; 16, five; 4 applicants have presented six; 7, seven; and so forth. This will give you the idea of the distribution.

Senator STEWART. Over what period of time are we talking about?

Mr. LEESE. This is since the inception of the act, in 1970.

Senator STEWART. Since 1970.

Mr. LEESE. That is correct.

Senator STEWART. So she has indicated that there were 900—is that figure correct—900 new type seed producers or small type seed producers who participated in the program since 1970?

Mr. LEESE. I do not believe she said 900. There have been 702 certificates issued since inception of the act. Some 200 applications are now pending.

Senator STEWART. Well, maybe I misunderstood her.

Mr. LEESE. Of this total, there is something, like, 167 different applicants that have presented applications.

Senator STEWART. Who have participated?

Mr. LEESE. Yes.

Senator STEWART. Is that where you got your figures, then, of 7 percent of those are experiment stations, and you say 24.

Ms. SCHLEI. Mr. Chairman, I think that we are using two sets of figures, now. I was referring to applications as opposed to certificates that were granted.

Senator STEWART. OK.

Ms. SCHLEI. And I think that the applications represent those farmers and small seed companies that are out there encouraged by the opportunity to get a return on this——

Senator STEWART. That is where we got the figure 900.

Ms. SCHLEI. That is right.

Senator STEWART. What are the percentages for those figures that he indicated? How many of those applications have we granted that fit into the category of large size entities as opposed to small size?

Mr. LEESE. I do not have that information, Mr. Chairman.

Senator STEWART. Could you provide that for the record, because that would be important? One of my questions was whether or not the small seed producer had really benefited from plant patenting. And I think that would be a question that you would get a better response on if you got the information as to the applications that were approved.

Ms. SCHLEI. We will supply that for the record, Mr. Chairman. I think, though, that we are talking about an investment, usually, some 7 years of research is involved in developing a new variety. A large company is capable, through product differentiation, through advertising of a trade name, to capitalize on that research absent plant variety protection.

It is the small farmer or the small seed company that does not have that dollar to invest in advertising, that cannot recoup that investment absent the kind of patent like protection that this act provides. So that, philosophically, absent this act, it would be the large seed company only that could afford to continue to be involved in research, or the government that could be involved in research.

We can also look at the degree to which research has been stimulated. When we look at, for instance, such crop as soybeans, which are difficult to hybridize, they received little protection prior to the Plant Variety Protection Act. The act reversed that trend. Since 1970, research spending has almost tripled on soybeans. There were three private soybean research programs in existence 12 years ago. Today there are more than 25 research programs going on. Between 1953 and 1970, up until the passage of the act, there were a total of 50 certified wheat varieties released by public agencies.

During the 7-year period, which is about what it takes to develop a new variety, between 1971 and 1978, 54 certified wheat varieties were released. That is more than the entire 17-year period before the passage of the act.

DEMOGRAPHIC DESCRIPTION OF PROTECTION GRANTED PURSUANT TO THE PLANT VARIETY PROTECTION ACT OF 1970

Type of applicant	Applications received	Percent applications received	Certificates granted	Percent certificates granted
Large seed companies	271	23.8	167	23.6
Small seed companies [1]	590	51.8	390	55.2
Individuals	52	4.6	32	4.5
Experiment stations	133	11.7	92	13.0
Foreign countries	94	8.2	26	3.7
Total	1,140	100.0	707	100.0

[1] Small seed companies are identified by the Plant Variety Protection Office of USDA and the Small Business Administration as those firms which have 500 or less employees or a gross annual sales volume of $9.5 million or less annually.

Senator Stewart. Let me ask you something.

Ms. Schlei. Yes, sir.

Senator Stewart. You seem to be speaking to another suggestion that has been made. And let me take these questions here just in sequence. It will not take long at all.

It has been suggested by some that the plant patenting process has caused a concentration in the seed industry. Do you have any idea as to what percentage of the market small seed producers controlled prior to the act, and what percentage of the market they control now? Have you done any studies on that at all?

Ms. Schlei. We do not have any information on that, Mr. Chairman. But, for example, we do know that, going back to the wheat, for example, there are 30 percent——

Senator Stewart. You talked about the wheat and you talked about the soybeans.

Ms. Schlei. There are 30 percent more wheat varieties on the market today than there were in 1970.

Senator **Stewart**. That is not my question. My question is who controls production of the seed? And who did prior to 1970, who does after 1970? And maybe someone else here can speak to that. Your contention is that there are more seed producers, that it enhances the capability of a small producer to do it. I want to know what facts you have got to back that up, other than what you have indicated to me.

If those new varieties are all controlled by a large size seed producer, both in the innovation process or afterward, I do not know that you can make the contention that you are making.

Ms. **Schlei**. I think that there are two issues. One is that there are more varieties on the market today than there were prior to 1970. The wheat is an example of that.

The second issue is whether there is greater concentration in the seed industry, that is, greater concentration in the firms that are producing seed. We would be happy to supply for the record figures on concentration in the seed production industry prior to and post——

Senator **Stewart**. If you could. I do not know that you have that information.

Ms. **Schlei**. I do not, either, sir, but we would try to ascertain that. However, certainly throughout all segments of our economy, we are continuing to see increased concentration in most industries. The question is whether or not the Plant Variety Protection Act has had any causal connection to increased concentration in the seed industry. And I would submit that there is no causal connection between concentration in the seed——

Senator **Stewart**. How can you make that statement when you do not even know whether or not there is a concentration in the seed producing industry? How can you make that statement?

Ms. **Schlei**. Sir, I would suggest that if there is an increased concentration in the seed producing industry, which would follow the trend of increased concentrations during the past decade in most industries, first of all, we would look to whether the degree of increased concentration was greater than the degree of increased concentration——

Senator **Stewart**. But you really do not know that, though.

Ms. **Schlei**. I do not know that, no, sir.

Senator **Stewart**. OK. Well, of course, the increased concentration in other industries has caused us the questionable benefit of large size cars that are not as energy efficient as other automobiles are. The steel industry that bought 40 million tons in the 1950's of inadequate steel producing facilities that they now want us to revise. So do not let us—for goodness sakes, do not let us promote a policy of the Department of Agriculture that would create the same kind of problem for it.

It may not seem to be a very important problem for some, but it is a hell of a problem to me, and I am not going to let this alone. If I thought for a minute that our patenting process was being utilized by large-size concerns to control the seed-producing industry, your bill would never get out of my committee.

Ms. **Schlei**. Mr. Chairman, I concur in your concern about the problem of increased concentration throughout all sectors of our economy.

Senator **Stewart**. Well, how about giving me the information?

Ms. **Schlei**. I will do that, sir. But the point that I wanted to make, though, was that this bill, I believe, has exactly the opposite effect. Absent a patent like protection.

Senator **Stewart**. Prove it.

Ms. **Schlei**. Yes, sir. Only large companies could——

Senator **Stewart**. Do not make the statement. Prove it to me. Not that I doubt your integrity, but prove it to me. I want to know what factual basis you are making that statement on. You do not know what concentration there was in the market prior to 1970, you have indicated you do not know now. You have indicated you do not know whether or not there is a causal connection between this particular patenting process and the production of seed. So I want you to prove that to me. Do not just make a statement up here; let us have some proof.

Ms. **Schlei**. We will try to submit any data that we have in the Department for the record on that point, Mr. Chairman.

[The following information was subsequently received by the committee:]

In response to Senator Stewart's question relative to the control of the production of seed prior to and after 1970, sufficient data are not available in the Department to allow a complete analysis of the seed industry. In our efforts to solicit information relative to the degree of concentration in the seed industry, we have also contacted the Census Bureau of the Department of Commerce, the Federal Trade Commission, the Justice Department, as well as the Securities and Exchange Commission (SEC).

Last year SEC began requiring line of business reporting for publicly-held corporations. This type of information would be useful in a review of concentration in the seed industry. However, less than half of the major seed-producing firms in the United States are publicly-held corporations, and further, the data will not be available for years prior to 1979.

A possible source of information from the private sector is the firm of L. William Teweles and Company of Milwaukee, Wisconsin. Mr. Teweles is a former seedsman who for many years has acted as a consultant to the seed industry on a number of acquisitions and mergers. We believe that he has more information regarding concentration.

Because of the need and desire for information relative to the control of seed production, the Department will pursue with the Census Bureau the feasibility of obtaining such data in its next enumeration in 1982. Currently, the Census 5-digit Standard Industry Classification (SIC) code does not reflect gross revenue data for the seed industry, but rather reports revenues of wholesalers of seed. Therefore, the census data for 1977, which will be released sometime this fall, will not prove to be a source of information for a complete review of concentration in the seed industry itself.

Senator **Stewart**. But do you not think that would be a fairly significant item?

Ms. **Schlei**. I think, Mr. Chairman, that, certainly, it is an item of concern and interest to us.

Senator **Stewart**. It is an item of concern and interest to you.

Ms. **Schlei**. I think that the problem of concentration in all sectors of the economy is a problem of great——

Senator **Stewart**. You and I are here to deal with the agricultural sector, though.

Ms. **Schlei**. That is right, sir. And we, for instance, are currently taking a very hard look under our packers and stockyards program at the problems of concentration in the packing industry.

Senator **Stewart**. Let us concentrate on the seed producing industry here.

Ms. Schlei. Yes, sir. But the one point that I would like to make to the chairman is that, absent any patent law, the only way in which somebody could gain the benefit of the research that went into producing a new variety would be to put a trade name on the variety and go out and advertise that trade name by product differentiation. That takes an awful lot of money, a big advertising budget. Only a large seed company or the Federal Government could afford research under those circumstances.

It is only by getting some kind of protection, some opportunity to get a return on the research investment guaranteed, such as through a patent law, that a small seed company or an individual farmer could afford to invest the 7 years into the research process, because only in that way could they protect themselves against their efforts being pirated away by a large seed company.

Senator Stewart. Let me tell you something. I was talking to a fellow who is a good friend of mine—he is a supporter of this legislation—and he indicated to me that some 10 years—maybe more than that, probably 15 years—had gone into the experimentation with regard to a new type of seed for a new type of plant.

Now, that was done by a small size seed production company over an extended period of time. The experiment station worked with the seed production company. One of the largest corporations in the world just bought the seed company. They are now going to promote the new seed variety. Just bought it, gobbled it up.

Ms. Schlei. No, sir, they bought it. And that small seed company had a right to turn down that offer if it was not in their economic interest to accept that offer. And if we believe that that is too much concentration, then we have a set of antitrust laws available to us to deal with that problem. And if those antitrust laws are inadequate, sir, then we can amend that set of legislation.

Senator Stewart. Hogwash. Those things have not been used since they were put on the books, not effectively, not successfully; have not been used since they were put on the books. That is just hogwash. I am sorry, but if the antitrust laws are relied on to weed out concentration in the economy of the agricultural sector of our economy, or anything else, you could not depend on those if your life depended on it. They just do not work. Name the last big antitrust case filed by the U.S. Government that was a success.

Ms. Schlei. Sir, I think that if our antitrust laws are inadequate at this time, then what we properly should be addressing is an amendment to that set of laws.

Senator Stewart. No, ma'am. You are wrong about that. Government policy, in many, many areas, makes concentration possible; tax policy, research policies. We have done some hearings in the Small Business Committee that indicated that the Department of Energy, along with the large size oil companies, put 100,000 retail gasoline dealers out of business in 1½ years, with regulations; 1½ years with regulations.

Those guys who operated those filling stations on the corner in neighborhoods were gone, they are gone. They are no longer there.

Ms. Schlei. Mr. Chairman, I stand corrected, and I agree with your point that we must scrutinize all legislation to ensure that it does not have——

Senator Stewart. Can we do it?

Ms. SCHLEI [continuing]. An anticompetitive impact. However, I do not believe that this legislation does have an anticompetitive impact. In fact, I believe that it enhances competition.

Senator STEWART. Well, let us build a record to prove that. Let us not just make statements, let us get facts and figures that indicate that that happens, and build a record to prove that, and ensure that that takes place. If you and I truly believe in the free enterprise system, let us protect it, let us work hard to protect it.

Now, what would this international union for the protection of new varieties of plants mean as far as our country is concerned? How would we benefit from that, membership in that?

Ms. SCHLEI. Mr. Chairman, that is an opportunity for us to participate and join in and exchange information and ideas with all of the other countries that are members of that organization. Whether or not we join that organization is in no way dependent on this legislation.

Senator STEWART. I was informed that it was.

Ms. SCHLEI. Sir, this legislation extends the time of the protection from 17 years to 18 years. That would make it more consistent with other countries in the world. However, our ability to join the international union is in no way contingent on that.

I might add that there is some very grave concern about the regulatory practices that are engaged in by certain European countries. I do not believe that whether or not we join that association would have any impact on our adopting those regulatory policies. The Plant Variety Protection Act has absolutely no regulatory scheme whatsoever. It is not the intention of this administration of the Department of Agriculture or the Plant Variety Protection Office, at any time, to add any regulatory scheme, nor do I believe that this Congress would subscribe to any regulatory scheme.

We believe that our farmers are the people most capable of making their own decisions about what kind of seeds they are going to use, and that those are going to be far better decisions than the Government could ever make for them. And we have no intention, at this time or at any other time, of adopting any of the regulatory schemes that are currently in effect in the European countries.

Mr. Chairman, in conclusion, I would like to reiterate that I share your concerns, and the concerns of those who oppose this bill, but I believe that those concerns can more appropriately be addressed in other ways.

The Department urges favorable consideration of the Plant Variety Protection Act amendments. I would be glad to respond to any questions that you might have.

Senator STEWART. You have, as you went through your testimony, responded very well to our questions. I will look forward to getting the other information for the record. I thank you for coming along with your colleagues and presenting your testimony today, and being so patient in waiting for me to open the Senate.

The next witness is Harold D. Loden, executive vice president of the American Seed Trade Association.

STATEMENT OF HAROLD E. LODEN, EXECUTIVE VICE PRESIDENT, AMERICAN SEED TRADE ASSOCIATION AND THE NATIONAL COUNCIL OF COMMERCIAL PLANT BREEDERS

Mr. **Loden**. Mr. Chairman, my name is Harold Loden. I am the executive vice president of the American Seed Trade Association and the National Council of Commercial Plant Breeders, both of these organizations strongly support this legislation. The American Seed Trade Association has about 700 members plus 65 State and regional associations, and we believe we represent the U.S. seed industry, and the National Council of Commercial Plant Breeders has membership of 36 firms who are engaged in proprietary development of varieties.

I have prepared a rather detailed statement which I will file for the record, and if it is agreeable to you, Mr. Chairman, I would like to go directly to some of the questions, some of the unanswered questions from the previous witness.

Senator **Stewart**. If you could do that, that would be fine. Without objection, we will make your statement a part of the record.[1]

Mr. **Loden**. The first question I would like to address is a question you raised concerning Dr. W. L. Brown, the chairman of the board of Pioneer Hi-Bred and that company. First of all, Dr. Brown is a member of the National Plant Germplasm Committee. He is there not because he is the chairman of the board of Pioneer Hi-Bred but because he is a very eminent scientist. He is a member of the National Academy of Sciences. He is one of the two candidates for presidency of the Crop Science Society of America which will be elected this year.

And he was there because of the fact that the National Council of Commercial Plant Breeders was requested to nominate an individual. Dr. Brown was our nominee.

Senator **Stewart**. And you picked the best.

Mr. **Loden**. And that is why Dr. Brown is there.

Senator **Stewart**. I did not mean anything. I just wanted to know who he was and what company he represented.

Mr. **Loden**. Let me give you just a little about the company he represents, and I think it has very direct bearing on the basic question of this legislation. The company he represents is Pioneer Hi-Bred International. It was started by Henry A. Wallace in the 1920's. It was started to produce hybrid corn.

Hybrid corn has biological protection, and it was in the environment of this biological protection of a hybrid that one of the largest seed companies in this country grew, because they had the kind of protection biologically that this legislation in 1970 has extended legally to nonhybrid crops.

Pioneer is one of the largest and probably the largest producer of hybrid corn in the United States and sells corn around the world. They are involved in hybrid sorghum. They are involved in a wheat variety development program. They are involved in alfalfa programs. They formerly were involved in chickens. They disposed of their chicken business to concentrate on seeds.

They spent a lot of money at one time but ceased the operation about four years ago in trying to develop improved strains of cattle by selecting high potency, high heredity characteristics in the bulls.

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[1] See p. 75 for the prepared statement of Mr. Loden.

They also have one or two other smaller aspects of their company such as providing computer services to other research companies some of which are offshoots of their business.

Senator STEWART. So basically, they are in the seed production business.

Mr. LODEN. They are a seed-producing company, one of the largest in the United States, and their growth has been developed fundamentally on hybrid crops, corn and sorghum. Now, they are dealing with nonhybrid crops, soybeans, wheat and alfalfa.

Senator STEWART. Some folks have indicated an increasing concentration in the seed industry. ITT recently bought Burpee, didn't it?

Mr. LODEN. ITT bought Burpee from General Foods about 12 to 15 months ago.

Senator STEWART. And the trend seems to be continuing. What do you attribute this increasing concentration in the seed to?

Mr. LODEN. Mr. Chairman, I would like to read, if I may, and make it short, the statement I have regarding that point in my testimony.

Senator STEWART. Fine.

Mr. LODEN. Much has been said about the increased involvement of multinational corporations in the seed business. This is true. It has been charged that this has been due to the Plant Variety Protection Act. This is not true.

The takeover phenomenon is not unique to the seed industry. It is a feature of our financial situation, particularly the structure the U.S. investments tax laws and the declining value of the American dollar when compared to other currencies.

The basic decision in a merger or acquisition is related to profitability and long range growth potential of the business. Seed companies are research-based, and if they have been successful in their research, they have been profitable. They have growth potential and are attractive prospects for mergers or acquisitions.

Another point which I alluded to previously is that a majority of the companies which have been involved in mergers and acquisitions are those whose base has been primarily in the production of hybrid crops, and it is not a result of the Plant Variety Protection Act.

Senator STEWART. So you are saying that concentration is taking place and has taken place.

Mr. LODEN. I am not sure that concentration is the correct word, Mr. Chairman. In our association since I retired from the seed business 6 years ago and came here, we have had an increase of 25 net new members per year.

Senator STEWART. So that would seem to indicate new companies.

Mr. LODEN. There has been growth of new companies. I would not say that it is concentration as much as an exchange of ownership. In a few cases one company has purchased more than one company. For example, ITT owns both O. M. Scott and Burpee.

Senator STEWART. In other words, ITT bought two of these seed production companies.

Mr. **Loden**. Right. But you got to look also at the other point that ITT owns Burpee because General Foods was unsatisfied with the acquisition.

So all of these acquisitions have not been happy marriages. There have been a number of acquisitions which have subsequently been sold because the seed companies did not meet the expectations of the people who bought them.

Senator **Stewart**. That is one of the things I am concerned about, and not necessarily with specific regard to this legislation. But there have not been happy marriages in other areas either.

In other words, an innovative company that was profitable has been taken over by a large-size outfit. They are less innovative after that. A lot of times they are less productive. A lot of times they are less profitable, and it may involve something that is a highly important portion of our economy that would be beneficial to have somebody there who is interested in, say, in this instance, in producing good seed that would make us competitive with other countries.

You know, that is one of the ramifications of "big is better" that we have not really explored adequately, and I do not know that that is necessarily the responsibility of government, but I think it is the responsibility of government in cooperation with, say, perhaps management and labor. That is another point.

The thing I am concerned about is whether or not this patent process that we instituted in 1970 enhances the concentration. Your statement to me is that it is hybrid seed that they have been involved in, hybrid crops and this was to protect the nonhybrid crops, is that what it is?

Mr. **Loden**. The 1970 act protects only nonhybrid crops. The present concentration has been primarily involved in the acquisitions of hybrid seed companies, because the major companies in this country are those involved in hybrid crops because they have biological protection, and it was in that economic environment they were able to grow.

Senator **Stewart**. I am a practicing attorney by profession. What do you mean by biological protection?

Mr. **Loden**. All right. In biological protection, you have a hybrid and the hybrid has parents. You develop those parents in a research program, and it is the crossing between those two parents—you have probably seen it as you ride through Alabama—which produces the hybrid.

Senator **Stewart**. Are you saying the seed company that develops those has the parents?

Mr. **Loden**. Yes, and it is their property. That it is their personal property, and they do not sell it so they control it. That is biological protection.

Now, another question which was raised and which I would like to point to is this matter of the support of the U.S. Department of Agriculture of plant germplasm. I am not an employee of USDA. I do serve and have served since its inception as a member of the National Plant Genetic Resources Board which is advisory to the Secretary of Agriculture. It was appointed after—the momentum for the appointment of that board came after the corn blight of

1970 and 1971. It was one of the few boards, advisory boards, that this administration has seen fit to continue.

This board has made recommendations since 1972 or 1973 in its beginning for money to be used for plant genetic resources. We had a meeting last week—a week ago tomorrow—and the board recommended that we request $10 million for concentration on three crops which are considered in a precarious position, not because of any protection or anything else. Those three crops are corn, soybeans which has a narrow germplasm base, and the phaseolous type of green beans.

So that board has recommended to the Department of Agriculture that $10 million be asked for in the 1982 budget which is——

Senator STEWART. Just for those three crops?

Mr. LODEN. Just for those three crops.

Senator STEWART. Well, how in the world would $500,000 a year—oh, that is just on the classification system.

Mr. LODEN. The point is that similar quantities of money have been requested previously. I can say this, but the Department employees cannot tell you this. It has been——

Senator STEWART. Wait just a minute. You said something. I have been up here for almost 2 years now, and everytime I get one of these hearings, the Department employees cannot tell me as a member of the U.S. Senate what you can tell me.

Mr. LODEN. Well, that is just true because they operate under the restrictions, as I understand it, that they——

Senator STEWART. They are members of the team and they do not say anything.

Mr. LODEN. I do not know if that is the right word. They operate under restrictions that they have to support what comes out of the office or the administration's position.

Senator STEWART. Even if the administration position is dumb, they have got to come up here as intelligent humans and say, "you know, even though this is a dumb position * * *."

Mr. LODEN. I think that the point is that these recommendations have been made. They drop through the cracks at some point, either in Agriculture, OMB, Senate subcommittees or in Senate Finance hearings.

Senator STEWART. Could be.

Mr. LODEN. The orginal requests have been made, and this whole matter of plant germplasm is not new. It was the basis on which the Department of Agriculture was founded a little over 100 years ago. That was its first mission, and it has been doing that ever since.

Senator STEWART. To protect the——

Mr. LODEN. To go out and collect materials and make them available for breeders. Germplasm preservation and collection has been the core or was the beginning of the USDA. It is the basis on which much of the programs have been developed, and it is not any new program. It did not start in 1950. It did not start in 1980 in January.

Those are just evolutionary stages of protecting what has already been started, and this germplasm board prepared, under the direction of the Secretary, Dr. Lewis, who will testify later this morning, this publication "Plant Genetic Resources—Conservation and Use" and it outlines the complete program of the U.S. Department of Agriculture, the way it should be, what has been done and what is needed. And I will make this a part of the record.[1]

Senator **Stewart**. I would like to have it made part of the record. Let me just say that I am new to this particular process, but, you know, we have had this kind of problem before in the Government entity and it operates fairly slowly.

We just put the finishing touches on an energy package dealing with alternative sources of energy, many of which involve technologies that are not new. And you know, I read a study not too long ago that was prepared by a commission appointed by President Harry Truman some 27 years ago that indicated that perhaps we ought to get involved in some of these things.

So the fact that you are telling me this is a good bit of history that maybe we can take with us and emphasize this a little more. Six and one-half million dollars for the original purpose out of a budget—what is your budget?

Mr. **Leese**. $359,000 for the plant varieties——

Senator **Stewart**. No, no. I mean what is the total budget of the Agriculture Department. Do you have any idea?

Mr. **Stansbury**. About $25 billion.

Senator **Stewart**. $25 billion. For the original purpose, $6½ million we sort of have gotten away from that. Maybe we are making an error in our assessment of what the real priorities ought to be.

Mr. **Loden**. We have been beating the band, been beating the drum trying to get the support for this program.

Senator **Stewart**. You have somebody here, Mr. Loden, who is going to help you beat that drum.

Mr. **Loden**. Good, we appreciate it. I would like to respond to one additional question, if I may, Mr. Chairman. You raised a question about small businesses and the effect on small businesses.

Senator **Stewart**. Yes. I want to know how a small seed producer would be affected by this bill.

Mr. **Loden**. Let me give you a specific example, and I will use the names. This is a company called Silver Lane Hybrid. It is located in Indiana. He is a small one-man and a son, family operation, producing certified soybeans and hybrid corn. He made this statement to the American Society of Agronomy about 2 years ago. He said:

> Let me tell you what the plant variety protection did for me. Before 1970 when I had protection, I only had one choice in terms of the soybean varieties I grew and sold, and that was what the experiment station had, and if it was good and it sold, I had a profitable business. If they laid an egg, I did not sell any seed.

He says:

> Now, I still have that option. Furthermore, I have a second option that I can join up and be a distributor or a grower of soybeans for some company who is large enough to have their own program.

And he says:

> Secondly or thirdly, I have joined in with a group of other small, one-man operations, and we have a cooperative soybean research program, out of which I can have my own propriety varieties if they are good enough.

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[1] See pp. 85–116 for a reprint of the above-referred to booklet.

And he says:

> As a result of my having three choices instead of one choice, my business is on a more financially stable basis.

I think that illustrates very well——

Senator STEWART. Yes, it does.

Mr. LODEN [continuing]. The whole story.

Senator STEWART. It does. Thank you very much for your testimony. I appreciate the document that you asked us to put in the record, and I will, at this time, officially put it in the record. It is the plant genetic resources conservation use study prepared by the National Plant Genetic Resources Board. I assume that is part of the U.S. Department of Agriculture, that publication.

Mr. LODEN. Yes.

Senator STEWART. I thank you, again, Mr. Loden, for being here and for sharing with us that bit of history as to why the Agriculture Department got started in the first place. I appreciate that.

The next witness is Mr. Cary Fowler, the National Sharecroppers Fund.[1]

STATEMENT OF CARY FOWLER, NATIONAL SHARECROPPERS FUND, CHARLOTTE, N.C.

Mr. FOWLER. My name is Cary Fowler, and I represent the National Sharecroppers Fund.

Senator STEWART. What is the National Sharecroppers Fund?

Mr. FOWLER. The National Sharecroppers Fund is a nonprofit organization which was founded in 1937. Since then, we have been working with and hopefully for sharecroppers and tenant farmers and small farmers.

Senator STEWART. OK.

Mr. FOWLER. We have identified what we think are seven basic issues with this legislation, and I would like to just touch very briefly on those. Before I do that, though, I would like to respond to what I sense are the arguments that are being made in favor of the legislation.

I think there is one central argument that is being made and that is that the legislation will support and encourage research in the development of more new varieties. We feel we have been given very little evidence to support this contention. We have been given a survey conducted by the National Council of Commercial Plant Breeders, and it shows that since 1960 research expenditures as a percentage of total sales have been going up quite steadily.

What it also shows, if you look very closely, is that the increase in research that has been determined as a percentage of total sales slowed down after 1970, and we are not contending that that has any relationship to the Plant Variety Protection Act. We are simply saying that that is an open question. It might, it might not and we are not sure.

But the figures that we have been given to support the administration's contention here clearly do not show any massive increase in research since 1970.

Senator STEWART. Well, since you say there is no causal relation, why do you bring that point up in the first place?

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[1] See p. 117 for the prepared statement of Mr. Fowler.

Mr. **Fowler**. Well, actually I am not saying that there is no causal relationship. I am saying there might be. We are not in a position to know for sure.

Senator **Stewart**. OK.

Mr. **Fowler**. We have also been given two examples from the department about increases in numbers of new varieties, one has to do with wheat. We are told that 17 years prior to the enactment of the legislation, 50 new varieties of wheat came on the market. Seven years after it, we have 54 new varieties. And we would simply point out that it normally takes longer than 7 years to develop a new variety of wheat.

The case of soybeans is somewhat similar. There has been a remarkable increase in breeding of soybean varieties since 1970. It is hard to sort out, however, and we must factor into our consideration here, how much of that is due to the Plant Variety Protection Act and how much of it is due to the remarkable increase in acreage devoted to soybeans in the last 30 years.

Senator **Stewart**. I think they have indicated, and maybe not necessarily here this morning, but they have indicated to me that there would have to be some causal connection made between new varieties in soybeans and the tremendous amount of acreage that is devoted to that.

They have not said that new varieties of soybeans came from this patenting process.

Let us just get to the heart of the matter. It is your basic statement that the small farmer has been harmed by the patenting process. How?

Mr. **Fowler**. We believe the small farmer has.

Senator **Stewart**. How?

Mr. **Fowler**. We look at the increase in seed prices, the prospect of further consolidation of the seed industry, and we look at such questions as genetic uniformity and the demise of genetic diversity and there are a few other issues I would like to bring up.

Senator **Stewart**. Well, let us just take one, increase in seed prices. What has been the increase in seed prices?

Mr. **Fowler**. Well, before 1970, the seed prices generally followed the crop price index. According to an unpublished National Science Foundation report, since 1970, there has been no relationship between seed prices and the crop price index, and in fact, seed prices have risen faster than any other agricultural input since 1970.

Senator **Stewart**. What has been the increase since 1970 in seed prices?

Mr. **Fowler**. I am not sure of the percentage of increase, I am afraid.

Senator **Stewart**. Well, how do you make the statement that there has been a larger percentage in the increase of that particular item than any other item in the input without knowing what the increase is?

Mr. **Fowler**. Well, if you look at the USDA statistics on increases in input costs for farmers, seeds tops the list, and I am sorry I do not know the exact percentage, but I would be glad to get it for you.

Senator **Stewart**. What is the percentage? Can you give it to me?

Mr. **Loden**. It is 2.6 percent, and it is the smallest input in agricultural production, even with the increases in cost.

Mr. **Fowler**. I would dispute that. I would be glad to get you the information.

Senator **Stewart**. You know the fact that you dispute it is of interest to me, but I want the facts on which you base your statements.

Mr. **Fowler**. I would be very happy to get that information for you.

Senator **Stewart**. All right. I am just amazed that that would be the case with energy costs going up like they have been and those energy costs also have an impact on the production of fertilizer and the things that I have seen here in committee indicate that those two items, particularly since the 1973–74 price increases or hikes by OPEC in imported oil have been the biggest increases percentagewise. Now, you may be correct, but I would like to see that.

Mr. **Fowler**. I will be glad to get that information for you.

Senator **Stewart**. How do you relate that to this patent process, though?

Mr. **Fowler**. We feel like that is an unchartered area for the USDA and also for opponents of this legislation, because it is very hard to sort it out. I spoke with the person at the National Science Foundation who did this study. She said it was a very hard thing to get very definite in scientific terms, about how much of the increase had been due to the patenting, how much had not been due to it.

We think that this is an area that probably warrants further——

Senator **Stewart**. You say you cannot substantiate that the causal connection between the patent process and the increase in seed prices, you do not know about the increase. What are you saying there?

Mr. **Fowler**. Well, I think this is an area that warrants further research by the Department of Agriculture. I do contend quite strongly that my previous statement about the increase in seed prices was correct, and I think that we are not, as the National Sharecroppers Fund, we are not economists and we are not in a position to do the types of study that you would want to have done on this issue.

Senator **Stewart**. Can you refute that from the Department of Agriculture? Can you get me statistics that indicate the percentage of increase in the seed cost prior to 1976 for a 5-year period and add it to 1970 for two 5-year periods, can you get that for me?

Ms. **Schlei**. We will get that and supply it to you for the record.

Senator **Stewart**. If you have it. Now, I do not want you to go through some machinations to get it up if you do not have it, but if you got someway to get ahold of it, I would appreciate it.

Mr. **Leese**. I only have one citation from a seed company concerning the very popular sweet snap peas, and the increase due to the protection was 16 cents a pound, and that is the only information I have on that.

Senator **Stewart**. So there was some increase tied to the protection of the seed?

Mr. **Leese**. Yes; but this snap pea increases the productivity about threefold. In other words, it was developed for the use of the pod also. Before, we used just the seed.

Senator **Stewart**. So for the purposes of the farmer's economic situation——

Mr. **Leese**. It increases his yield by three times.

Senator **Stewart**. His yield would be increased by three times. The seed price would be increased by, say, 16 percent.

Mr. **Leese**. Sixteen cents a pound.

Senator **Stewart**. Sixteen cents a pound?

Mr. **Leese**. Right.

Senator **Stewart**. What percentage increase would that be, do you know?

Mr. **Leese**. I do not know.

Senator **Stewart**. Well, how about getting me some facts on that.

[The following information was subsequently received by the committee:]

TABLE 1.—INDEX OF PRICES PAID BY FARMERS FOR SELECTED AGRICULTURAL INPUT ITEMS, 1965–78 [1]

Year	Feed	Seed	Fertilizer	Agricultural chemicals	Fuel and energy
1965	$97	$100	$103	$98	$98
1966	101	98	102	99	98
1967	100	100	100	100	100
1968	94	104	94	101	101
1969	96	106	87	100	102
1970	101	112	88	98	104
1971	105	124	91	100	107
1972	106	135	94	103	108
1973	160	167	102	105	116
1974	194	215	167	119	159
1975	187	245	217	160	177
1976	191	241	185	174	187
1977	186	261	181	157	202
1978	183	273	180	147	212

[1] Excerpted from 1979 Agricultural Statistics, Table 651, page 454.

TABLE 2.—FARM PRODUCTION EXPENSES; SELECTED CATEGORIES BY EXPENDITURE AND PROPORTION OF THE TOTAL *

Year	Feed		Seed [1]		Fertilizer [2]		Chemicals, miscellaneous [3]		Petroleum, fuel and oil [4]	
	Million dollars	Percent	Million dollars	Percent	Million dollars	Percent	Million dollars	Percent	Million dollars	Percent
1964	5,512	17.3	661	2.1	1,888	5.9	4,610	14.5	1,549	4.8
1965	5,674	16.9	720	2.1	1,994	5.9	4,857	14.4	1,567	4.7
1966	6,401	17.5	760	2.3	2,219	6.1	5,130	14.0	1,616	4.4
1967	6,646	17.4	814	2.1	2,429	6.4	5,619	14.7	1,657	4.3
1968	6,357	16.1	831	2.1	2,434	6.2	5,951	15.1	1.662	4.2
1969	7,100	16.9	871	2.1	2,312	5.5	6,232	14.8	1,717	4.1
1970	8,028	18.1	927	2.1	2,390	5.4	6,615	14.9	1,711	3.8
1971	8,049	17.0	1,072	2.3	2,633	5.6	7,211	15.2	1,722	3.6
1972	8,397	16.0	1,115	2.1	2,690	5.1	7,818	14.9	1,688	3.2
1973	13,224	20.2	1,617	2.5	3,354	5.1	8,836	13.5	1,877	2.9
1974	14,513	20.1	2,082	2.9	5,808	8.0	10,178	14.1	2.690	3.7
1975	12,647	16.7	2,293	3.0	6,383	8.4	11,487	15.1	3,318	4.4

See footnotes at end of table.

TABLE 2.—FARM PRODUCTION EXPENSES; SELECTED CATEGORIES BY EXPENDITURE AND PROPORTION OF THE TOTAL *—Continued

Year	Feed		Seed [1]		Fertilizer [2]		Chemicals, miscellaneous [3]		Petroleum, fuel and oil [4]	
	Million dollars	Percent	Million dollars	Percent	Million dollars	Percent	Million dollars	Percent	Million dollars	Percent
1976	14,370	17.3	2,537	3.0	6,141	7.4	12,586	15.1	3,966	4.8
1977	13,993	15.8	2,856	3.2	6.152	6.9	13,717	15.4	4,356	4.9
1978	14,439	14.7	3,080	3.1	6,335	6.5	14,930	15.2	4,627	4.7

[1] Includes bulbs, plants, trees.

[2] Includes lime.

[3] Includes interest on nonreal estate debt, pesticides, ginning, electricity and telephones (business share), livestock marketing charges, containers, milk hauling, irrigation, grazing, binding materials, tolls for sirup, horses and mules, harness and saddlery, miscellaneous hardware (including blacksmithing), veterinary services and medicines, net insurance premiums (crop, fire, wind, and hail) machine hire and custom work, miscellaneous livestock and poultry, small hand tools, dairy supplies, nursery and greenhouse, apiary, and other miscellaneous. Source: Farm Income Statistics, USDA, ESCS, Statistical Bulletin No. 627, table 15H, page 45.

[4] Petroleum fuel and oil for farm business use. Source: Farm Income Statistics, Statistical Bulletin No. 627, page 45.

* Sources: Agricultural Statistics, 1979, page 464; and Farm Income Statistics, Statistical Bulletin No. 627, page 45.

CHANGES IN PRICES PAID BY FARMERS FOR PRODUCTION ITEMS

[Percent change]

Item	Apr. 15, 1979 to Apr. 15, 1980	May 15, 1979 to May 15, 1980
Feed	6.6	5.4
Feeder livestock	−15.5	−16.4
Seed	9.5	9.5
Fertilizer	30.5	27.8
Agricultural chemicals	16.9	21.2
Fuels and energy	56.1	50.4
Farm and motor supplies	17.4	18.3
Autos and trucks	6.4	2.2
Tractors and self-propelled machinery	13.2	13.2
Other machinery	12.3	12.3
Building and fencing	7.9	8.2
Farm services and cash rent	6.4	6.4
Interest on farm real estate debt	25.1	25.1
Taxes	8.0	8.0
Wage rates	5.6	5.6

Source: Agricultural Outlook, AO-SS June 1980.

INPUTS

Farm Production Input Costs Rise.—In 1980, the total cost of U.S. farm production inputs is expected to rise 10 to 14 percent from last year's total. Farm production costs are being driven up mainly by higher prices for nonfarm inputs—energy, fertilizer, and interest rates in particular.

May 1980 prices for petroleum-based fuels exceeded prices a year ago by more than 50 percent. Rising fuel prices have increased fuel's share of total farm production expenses from about 3 percent in 1974 to about 7 percent in 1980. However, this does not include energy used in fertilizer production, which is the largest component of farm energy use.

Prices for feed and seed—major farm-produced inputs—are rising more slowly than the overall rate of increase. Feeder livestock, alone among farm-produced inputs, will be priced lower this year than last. (Emphasis added.)

Not all nonfarm inputs have risen in price as much as fuel, fertilizers, and interest rates. Price levels for automobiles, trucks, buildings, fencing, farm services, cash rent, taxes and labor have risen at less than the rate of inflation in recent months. These inputs together with inputs of farm origin, make up over half of all farm production expenses.

Mr. **Fowler.** If I could just deal first with the issue of genetic uniformity and genetic diversity which you have been touching on before. What is, I think, generally recognized as a classic 1972 study of the National Academy of Sciences, Genetic Vulnerability of Major Crops—is the name of the study—stated that our plant variety protection laws were, quote, "narrowing the germplasm base," and since then the commercial——

Senator **Stewart**. How?

Mr. **Fowler**. Let me get into the three areas, then, that I think——

Senator **Stewart**. How does it narrow the base?

Mr. **Fowler**. The National Academy of Sciences did not go into any depth on that. They just simply made the statement.

Senator **Stewart**. You mean they just made the statement that the patent process narrowed our genetic base for our crops and did not go into how?

Mr. **Fowler**. That is correct. I would be glad to tell you my own opinion about that.

Senator **Stewart**. You tell me.

Mr. **Fowler**. Most of our crops that we grow here in the United States are not native to the United States. They originate in what we call developing countries and the genetic diversity is represented in what are called gene centers that are dotted around the globe.

In these areas, seed companies have begun to promote new varieties. In these areas, traditional varieties are viewed, naturally, as competition by the seed companies for their newer varieties.

In the process of just normal business activities, a lot of the traditional varieties come to be replaced by the newer varieties that are offered by the seed companies. There are no comprehensive programs to insure that as these traditional varieties, which represent a great deal of genetic diversity and wealth for us, are replaced by new varieties, they are preserved in a seed bank or any other way.

And there are numerous academic studies coming from the United Nations and universities around the world that document that general process.

Now, in the final impact statement that the Department submitted on this piece of legislation, they noted that this legislation would, quote, "facilitate international trade." If it does that, we make the assumption that it will contribute—how much we do not know—but it will contribute to this process whereby new varieties are replacing traditional varieties without benefit of any programs to insure that those older varieties, traditional varieties are, in fact, preserved.

Senator **Stewart**. Well, what do you want? Do you want a program to protect the old varieties in conjunction with a patenting process?

Mr. **Fowler**. That would be nice.

Senator **Stewart**. I mean, I do not see the causal connection between the patenting process for new varieties and the protection of the old ones. I am having trouble linking that up.

Mr. **Fowler**. It is an indirect relationship I believe, and the relationship is in that area of international trade, the facilitation of international trade, and what the consequences are given the fact that we do not have a system to ensure preservation of the old varieties.

Senator **Stewart**. In other words, in this process of replacing the old ones with the new ones, crops might be less disease resistant, and even though they produce larger yields might get in a situation where corn or soybeans, green beans are in a precarious position because of a narrow genetic base?

Mr. **Fowler**. Yes.

Senator **Stewart**. And they are not keeping that old one. So as a result, we actually lose corn, the soybeans and the green beans sometime down in the future, is that what you are saying?

Mr. **Fowler**. I think that is essentially what I am saying, yes, sir.

There are two other areas that I would point out here, and one is that we suspect that plant patenting also serves to encourage companies to drop traditional varieties from their listings. They would do that because for traditional varieties there is a good bit of competition. For patented varieties there is, of course, much less.

And there are no provisions within U.S. law at present to ensure even in our own country that traditional varieties that are dropped from catalogs of seed companies are, in fact, preserved, and that is another possible area of trouble here.

And finally, I would say, just to finish out this area, that is that there is a certain degree of uniformity that is necessary just for standardization and enforcement purposes for the law.

In 1968, then Secretary of Agriculture, Orville Freeman, stated that he thought the proposals were, "scientifically and legally unsound," and he went into some depth in his testimony about the futility of attempting to encourage genetic uniformity for the purpose of enforcing such a plant patent law, and if you wish, I will submit that testimony of his for your own consideration.

That is, perhaps, one of our most important concerns, and if I could, just for a moment, respond to something that Ms. Schlei said, we are very supportive of the work that has begun in the USDA to computerize an information system on the genetic resources that we have.

But we think that this classification process that has begun is not terribly related to—or dependent upon—the Plant Variety Protection Act, and as evidence of that, I would just simply note that the first crop that was selected for computerization was tomatoes, and that is a crop that is not included in the Plant Variety Protection Act.

So it would appear that that kind of system can be established with or without the Plant Variety Protection Act.

Another very important area of our concern has to do with the free exchange of information and crop breeding materials. Let me just quote you a statement that was made on behalf of the International Corn and Wheat Improvement Center. That is CIMMYT in Mexico, perhaps one of the most famous crop breeding institutes in the world.

They said that they, quote, "take a strong stand against it,"—plant patent laws, because it "restricts the free exchange of genetic materials." And they go on to say that, quote, "in a system of patents and royalties, CIMMYT and IRRI," that is the International-al Rice Research Institute in the Philippines, "are restricted on the distribution of basic breeding materials and advance promising lines. If all companies could have equal rights to increase and market CIMMYT materials that they found desirable for a normal seed profit, there would be no problem, but when patents and royalties are involved, it precludes other companies or the State from marketing a particular variety CIMMYT may release."

The United Nations Food and Agriculture Organization in a policy statement that they issued in February made this statement. "While the convention," and they are speaking here of UPOV, "While the convention may have been established to protect the rights of plant breeders, it has, in fact, contributed to an excessively monopolistic atmosphere in plant breeding in developed countries which has had negative effects on the complex structure of international plant breeding. An important example of such negative effects recently encountered by FAO in the U.N. system has been the restriction of a free exchange of some categories of germplasm." I understand the last 2 years they have held at least two conferences in Europe trying to work out some of these difficulties they have encountered in the area of exchange of information in genetic materials.

Again, Secretary Freeman in 1968 stated that, quote, "inevitably plant patent laws would," quote, "inhibit research by preventing the free interchange of information on genetic material on breeders."

As I mentioned before, we are also concerned about seed company consolidations. Recently some 50 once independent seed companies have been taken over by predominantly large multinational corporations, most of them active in the petrochemical industry.

Senator **Stewart**. What are some of those?

Mr. **Fowler**. I have a list which, if you want to follow it, is on page 7 of my testimony.

Senator **Stewart**. I can read it over while you are testifying.

Mr. **Fowler**. OK. But I think if you look at the right column of this list you will see a number of seed companies which are familiar to you and on the left the new owners which are perhaps, even more familiar.

If I can talk just briefly about the issue of market control. In hearings in the House Agriculture Subcommittee, the USDA and other proponents of this legislation mentioned, at various times, that seven companies had received 17 or 19 percent of the patents, and today, we are told that the seven had received 24.4 percent.

Our own figures, using USDA data, indicate that this is incorrect, that five companies now hold 30 percent of all the patents granted, and as I look at Ms. Schlei's testimony, I believe I can point out to you where the problem occurs.

She lists the seven companies as Asgrow, Burpee, DeKalb, Ferry-Morse, Keystone, Northrup King, and Pioneer. Well, when we say that five companies hold 30 percent of the patents, we are talking about five companies and their subsidiaries. I think that is probably a valid way to look at it.

Asgrow is a subsidiary of Upjohn and Upjohn also owns Associated Seeds. Burpee, as you know, is a subsidiary of ITT. DeKalb is independently owned. Ferry-Morse is owned by Union Carbide, and

Union Carbide also owns Keystone which is listed separately here. Those are the same company.

Northrup King is owned by a Swiss firm named Sandoz, and Sandoz also owns National-NK and Rogers Bros., and Pioneer owns at least four other seed companies. So if one considers that, the concentration figures take a big jump.

We have also been told that the patents that have not been acquired by those companies have gone to, quote, "smaller companies." That was mentioned today. We think this is misleading because among these smaller companies are Cargill, Celanese, FMC, Ciba-Geigy, R. J. Reynolds or Amchem, Occidental Petroleum, Unilever, Olin, Royal Dutch Shell.

Among those that I just read out to you that the USDA characterizes as, "smaller companies", are the world's largest agribusiness company, the world's largest grain company and the world's largest seed company.

But we think that perhaps a more important way to look at this material is to look at each individual crop, because sunflowers do not compete with green beans, and we can lump them together and learn something about concentration and market control, but it is more important to look at the individual crops.

And when we take the crops that have experienced the most patenting activity, we find that three corporations hold 80 percent of the patents on beans. Four corporations hold 45 percent of the patents on cotton.

Four hold 60 percent of the patents on lettuce. Four hold 62 percent of the patents on peas. Four hold 48 percent of the patents on soybeans. Four hold 36 percent of the patents on wheat.

Those are for the crops that have had the greatest amount of patent activity. When one looks at the other crops with less patenting activity, the degree of concentration even rises. Four corporations have 69 percent of the patents on barley.

Two corporations hold all the patents on cauliflower. One holds all the patents on China Aster. One holds all the patents on eggplant. Two hold all the patents on sweet peas, and three hold all the patents on tobacco.

We are concerned about the future implications of these kinds of trends.

There are a couple of other claims that have been made about the Plant Variety Protection Act, and one is that the Plant Variety Protection Act has encouraged the formation of new companies.

We know of no study which would give us overall figures as to the total number of seed companies now or before 1970. We also know of no study which would indicate any sort of link between the Plant Variety Protection Act and these new companies.

And finally, we have to ask where these new companies are coming from. One of the things that has been found in Europe and other places is that with the onset of patenting laws we have some degree of people switching out of the public sector into the private sector and taking with them varieties that they have been working on at public expense to patent under a new patenting law.

So we really have to ask where these new companies are coming from and if, in fact, they do represent an overall increase.

Senator **Stewart**. I do not understand what you just said.

Mr. FOWLER. OK. Let me try to explain it again then.

Senator STEWART. In other words, you are saying they are coming out of the public sector into the private sector. Where would they go?

Mr. FOWLER. Well, they might be becoming what the USDA characterizes as one- and two-man seed companies. They might be going to work for larger seed companies.

Senator STEWART. How are they financing it?

Mr. FOWLER. I do not know.

Senator STEWART. I mean, if there are one- and two-man seed companies, would you not be arguing against your own point that there have been more of those created as a result of the patenting process?

Mr. FOWLER. The claim that is being made is that we are encouraging new companies to be developed and we are encouraging research and development.

We are not sure that we are actually encouraging new companies to be developed because we have not been given any statistics about that, and the question about whether we are actually encouraging development and more research has to be put off as well because we do not know whether that research was previously being done in the public sector, and what we are now witnessing just simply represents a switch from the public to the private sector.

These are all issues, Mr. Chairman, that we feel should really be looked into, and again, we are not in the best position to do that. We think that it should happen, though.

Another issue which concerns us is the desire of the Government to join UPOV. I simply want to read to you portions of a February 28, 1980 policy statement from the United Nations Food and Agriculture Organization. It is fairly lengthy, but I think it is impressive and you should know about it.

Quote, "while UPOV may promote progress in plant breeding in certain cases and has no direct effect on plant breeding in developing countries"——

Senator STEWART. Is this in your statement?

Mr. FOWLER. Yes; it is.

Senator STEWART. I am going to read every word of your statement so there is no necessity of you reading that.

Mr. FOWLER. Fine.

Senator STEWART. I am going to be the germplasm and the seed area expert in the U.S. Senate.

Mr. FOWLER. That would be terrific. I will just point out that the statement that the United Nations made on UPOV is echoed to some extent by public statements that have been made by Dr. Norman Borlaug, who is the Nobel prize winning director of CIMMYT and by Dr. Brady, who directs the International Rice Research Institute in the Philippines.

They have called UPOV and plant patenting laws, quote, "very undesirable."

The other question I would raise is that it will cost the American public some $100,000 to join, maybe more. I am not sure that we have really been given adequate reasons for why we should be joining this organization.

So we, at the Sharecroppers Fund, are not only opposed to U.S. entry into UPOV but we view negatively any legislation that would facilitate such a move, and that is the kind of language that is used in the written USDA report regarding this legislation about the relationship of this legislation to UPOV.

Senator STEWART. Ms. Schlei said that is not a part of this legislation.

Mr. FOWLER. She said correctly that the United States could join UPOV without the legislation. The legislation, though, in the final impact statement of the USDA is characterized as something that will harmonize——

Senator STEWART. Facilitate that.

Mr. FOWLER [continuing]. And facilitate that, yes, sir.

Senator STEWART. Is that correct?

Ms. SCHLEI. Yes, Mr. Chairman. Most international countries have 18 years. The United States has 17 years——

Senator STEWART. You already testified about that.

Ms. SCHLEI. That is right.

Senator STEWART. I am talking about the statement in the impact statement. I mean, is he correct in saying that in the impact with regard to this legislation you indicated it would facilitate our entry into that?

Ms. SCHLEI. That is correct, sir, to the negligible degree that it would be 18 years, but the United States can join that organization regardless of whether this bill is passed.

Senator STEWART. Well, I thought that was my question. I thought we had asked some questions about that and if that would facilitate that. And I thought your answer there was similar to what you gave. I got the impression that this did not have anything to do with that, whether it actually would help us in moving to join UPOV.

Ms. SCHLEI. To a very minor extent that is correct, sir.

Mr. FOWLER. Mr. Chairman, the final issue that is of concern to us bears on what we would consider to be moral and ethical questions involved. We have questions not only about the amendment but, of course, about the act itself.

These concerns have been brought up by a number of religious bodies. Recently the Catholic bishops representing 43 dioceses in 12 Midwestern States have issued a statement on this, asking for careful review of the present and pending seed patent legislation, saying that, quote, "the control of seeds, because it implies also the control of food production and, indeed, of life itself, should not be appropriated to itself by any company or nation." A number of other religious bodies have made similar statements.

Senator STEWART. Now, what are the statements? What is the nature of the statement?

Mr. FOWLER. Catholic bishops representing 43 dioceses in 12 Midwestern States have issued a statement on this matter in a pastoral letter, and they said, quote:

> The control of seeds, because it implies also the control of food production and, indeed, of life itself, should not be appropriated to itself by any company or nation. We, therefore, urge a careful review of present and pending seed patent legislation.

Similar kinds of statements have been issued by other denominations.

Senator **Stewart**. Well, what are they alleging? That this patent process has enhanced the control of the seed production and the seed preservation of germplasm preservation in this country by large size corporate entities, and therefore, they are obtaining control of food production? Is that the allegation they make?

Mr. **Fowler**. I think they have some of those concerns, and I think at the base they have other concerns which have not been brought out which simply bear on whether or not it is advisable for the Government to begin to have the type of relationship to nature and to seeds that is represented in the process of actually patenting seed varieties.

Senator **Stewart**. I do not understand that. I am lost.

Mr. **Fowler**. Well, there is a lot of concern about the question of patenting life forms.

Senator **Stewart**. Patenting life forms.

Mr. **Fowler**. Patenting forms of life.

Senator **Stewart**. You are talking about the seeds?

Mr. **Fowler**. Yes, sir, so that is the type of concern that they have.

I think that pretty well summarizes our major concerns. Let me just say that we feel there has been a great deal of controversy surrounding this amendment and that it is really time that the controversy be put behind us. We feel that the only way that it can be put behind us is if thorough and exhaustive and impartial studies are done, undertaking the many concerns that have been raised.

And we are very pleased at your statement that there will be more hearings on the overall problems of genetic conservation and genetic diversity. We are very excited about that.

Senator **Stewart**. Thank you.

Dr. Caldwell and Dr. Lewis will be heard from at this time if they do not mind. If you will summarize your testimony, I will ask you some questions. You can concentrate your efforts on the legislation and then speak to some of the matters that have been raised.

Before we get to that, Mr. Loden, you wanted to respond and I will allow you to respond, to some of the statements that have been made previously for the record, if that is all right. I will give you the opportunity not now but just in written statement for the record. We will hold the record open.

Dr. Caldwell, do you want to proceed?

STATEMENT OF DR. BILLY CALDWELL, DEPARTMENT OF CROP SCIENCES, NORTH CAROLINA STATE UNIVERSITY, RALEIGH, N.C.

Dr. **Caldwell**. Yes, sir, Mr. Chairman, I am Billy Caldwell——

Senator **Stewart**. Let me tell you about time, Dr. Lewis. I have the time necessary to put into this hearing. I do not have another meeting until 1 o'clock, and I intend to stay here until we get through. So we will give you adequate time to express yourself.

Dr. **Caldwell**. Thank you, sir. My name is Billy Caldwell. I am at North Carolina State University of which I am head of crop science. I am also president of the Crop Science Society of America.

In my role in North Carolina, I coordinate research and extension, teaching activities related to crop production, crop breeding, plant physiology and those items related to producing field crops in North Carolina.

Of course, the Crop Science Society is a professional society with over 4,000 members in the disciplines of plant breeding, genetics, crop production and crop physiology, turf management, and seed production.

My training and individual research has been in the area of soybean breeding and genetics and that I feel I am proud of. I have also conducted research on nitrogen fixation and biological nitrogen fixation. I have participated in a number of plant breeding conferences and edited the monograph on "Soybeans: Improvement, Production, and Uses," and chaired the World Soybean Conference II, which was held in Raleigh, N.C.

I want to enter my testimony in the record, if I might, Mr. Chairman.[1]

Senator **Stewart**. Fine.

Dr. **Caldwell**. And then I will summarize it as briefly as possible to give us time to discuss any of the areas that you would like to speak to or raise questions.

The act, I think, has benefited the consumer and the grower through improved varieties of better quality, that are more productive and contain resistance to an ever increasing number of pests that attack our crops. The need for the future will be even greater as new races or strains of pests evolve and the demand for food and fiber increase.

Resistance of varieties will continue to be our major defense against crop pests.

Senator **Stewart**. You are saying, Dr. Caldwell, in that argument that actually the research has been enhanced by the patenting process to provide more disease resistant varieties, and as a result of that we are getting a good benefit out of this?

Dr. **Caldwell**. Yes, sir.

Senator **Stewart**. How do you respond to the questions that have been raised by those here who say that this might have increased concentration in the production of seed, just taking their argument at its worst situation from the standpoint of production of food and fiber, that we are losing those more disease resistant varieties of the original strain. Even though they do not produce as much, they, perhaps, in some instances, are more disease resistant.

As a result of that loss, we may have a crop disease in the future that will inhibit us from or prohibit us from raising the food and fiber that is necessary. How do you respond to that?

Dr. **Caldwell**. Well, I go back to the point that was made earlier that all our crops are introduced. We started with introduced varieties. These may have been known as traditional varieties.

We selected in those, but we must remember that we introduced a pest or the pest evolved in this country. So as we evolve new varieties, so have the pests evolved. So you have got a counterbalance battle going on.

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[1] See p. 127 for the prepared statement of Dr. Caldwell.

And if we do not continue to develop new pest resistant varieties, then sooner or later the farmer is going to be out of business, because this is his main defense against pests.

And these old traditional varieties which we have talked about, the old germplasm, have been a resource and a source of seed for research. The old variety Ototan in soybeans, for example, a hay variety, black seeded, which we did not like very much, has served as a source of resistance for soybean cyst nematode, which is a major nematode pest in soybeans in the Southeast.

Senator STEWART. So you are saying that there is some benefit to maintaining those traditional varieties?

Dr. CALDWELL. Yes, sir, and they are maintained—the discussion this morning centered much around the National Seed Storage Laboratory at Fort Collins, Colo., and that is a valuable facility and resource. But we must remember that with every plant breeding operation there is also germplasm that each individual plant breeder maintains.

Also with each commodity there are working collections.

Senator STEWART. I understand that. What those that are opposing this legislation indicate is that, with the concentration in the seed production entities there will be less concern, perhaps, about the maintenance of these older traditional varieties, and there is concern about that.

Would you say that is an invalid concern?

Dr. CALDWELL. I think that is an invalid thing. In soybeans, the one I am most familiar and Dr. Lewis is familiar with cotton, we maintain all the old traditional varieties, plus any introduced varieties that are maintained in our working collections.

Senator STEWART. So you do not see any causal connection between the patenting process and the concentration in the production of seed and the loss of the more traditional varieties?

Dr. CALDWELL. No, sir. Dr. Lewis has served on these panels and he has looked at this in more detail. If you want him to respond also to this issue, I will not raise it again.

Senator STEWART. OK go ahead.

Dr. LEWIS. I will speak to that in my presentation.

Dr. CALDWELL. Another point that I would like to raise is the use of advanced technology such as new varieties often fail to recognize that unlocking nature's biological secrets becomes progressively more difficult and remember that the only way to increase a variety's potential is through genetics. I mean, all the production practices only allows it to run so fast, but the only way you increase a variety's potential is through genetics.

Through the Plant Variety Protection Act, a breeder can protect his product and reap the rewards of his efforts. This is true regardless of how or where he is employed. However, the new genetic combination is not immobilized, only the product.

In other words, what I am saying is that if a plant breeder develops a new variety, under this act, that variety that is protected is available to any other plant breeder who wants to use it as a breeding stock. He can use it as parents.

Therefore, only the product is protected. The genetic material is there for any plant breeder to use if he is creative and capable of making crosses with his materials.

Senator STEWART. So you are saying the patenting process is not an inhibitor to the exchange of that genetic material.

Dr. CALDWELL. No, sir. The exchanges that often are talked about is whether I can tell you you can use my breeding stocks or not. There is some proprietary information there. But once a variety is released and protected, that is available to any plant breeder anywhere to use in his program as crossing material for future varieties.

Senator STEWART. Of a new variety.

Dr. CALDWELL. And as a plant breeder, I do not really want his old variety. I would like to use his genetic stock.

Senator STEWART. Well, can you do that?

Dr. CALDWELL. Yes, sir. I believe that is right.

The concept of traditional varieties we have talked about, and I pretty well summarized that, is that we ought to modify and improve them. We do not discard them. And in soybeans to this point, and I have to refer to soybeans because that is where my heritage comes from, and I am most familiar with that crop, so far the germplasm bank that we have has been a resource for resistance to most pests that we have found in soybeans.

Senator STEWART. Let me ask you a question. Let us just take soybeans now. Did not one of our previous witnesses indicate that there was not a sufficiently broad base in that particular area and also corn and also certain types of green beans to protect those varieties that are now on the market?

Dr. CALDWELL. Sir, I think you can make that for any commodity as long as there is additional diversity in the centers of origin which are China and Korea for soybeans; you never have a sufficient base.

Senator STEWART. Well, it was not that you never have a sufficient base. It was that we have so narrow a base that there might be some potential for disaster in that crop.

Dr. CALDWELL. The National Academy of Science study pointed out that many of our current varieties are traced to several source parental material, the old traditional varieties we used as crossing material earlier, and that is true.

Senator STEWART. What caused that?

Dr. CALDWELL. Primarily that was the germplasm available. Also when you are trying with a very few hands which the USDA had and did most of the breeding earlier, you use your best times best in a breeding cross to get a little better because you do not have time to go to these old traditional type of black seeded types in the case of soybeans and work them back through the system because you are talking about 15 years or more. We use the economic types that are available, and those you used for crosses.

Senator STEWART. What has happened is because of the economics of the situation both in the time factor of going back the 15 years and coming forward and in the economics of producing your larger yields quicker by taking your best and breeding it with the best, is that what narrowed the base?

Dr. CALDWELL. This was a contributor to it. You only have a few varieties to work with. You bring them from the unadapted to adapted. See, when soybeans first come into this country——

Senator **Stewart**. Well, would that not happen if you had somebody, and maybe I am tracking this unnecessarily, but it might add credence to what some of the others said, would that not happen if you had someone who was motivated to get the best product in the shortest period of time which would be a large size commercial outfit, and there is nothing wrong with that, but could that not happen if you have an overconcentration of it and control over crops in an area?

Dr. **Caldwell**. Yes, it could happen. The narrowness of the soybean base occurred before the Plant Variety Protection Act.

Senator **Stewart**. I am not talking about the Plant Variety Protection Act now. I am on something else.

Dr. **Caldwell**. It is a similar situation. We had about six plant breeders in soybeans originally. They were charged with adapting this crop from Minnesota to Mississippi, and when you only have a few and you are also charged the same time with agronomic practices surrounding these crops, then you do the best you can with what you got on a meager budget.

Senator **Stewart**. But as quickly as you can.

Dr. **Caldwell**. As quickly as you can, and that is good by good gives you a little better in varietal development programs.

Senator **Stewart**. Which may narrow the base.

Dr. **Caldwell**. Which then if you need disease resistance you go back to the type that is unadapted, that has resistance through a concept called back-crossing which you use your adaptive type, recycle it everytime, picking up only that additional trait that you need and putting it in a new variety.

Senator **Stewart**. Which takes a good period of time.

Dr. **Caldwell**. It takes a good period. Even the back-crossing method which is probably one of the simplest procedures and most straightforward, more rapid procedure still is 4, 5 years.

And in the germplasm area in soybeans, China, as you recognize, is our source, and it has been out of bounds for us for a number of years. But related to an earlier question, how early we started collecting, the most extensive soybean collection was made by a fellow named Dorest in the early 1930's and that serves as our major base for soybeans still today even though we exchange germplasm many times with other countries, but some of those old varieties are still with us.

I also would like to talk just briefly about the interrelationship of private plant breeding and the public sector. I think we have overlooked this. In private plant breeding in the public sector, there is continuous work coverage, joint work sessions that exist, and in these sessions is where there is an exchange of ideas, a change of future priorities and a change of those types of scientific information which allows both the public and private sector to move forward in plant breeding and variety development.

Also that most of our private industries test their material prior to its release in our university official variety trials. In North Carolina we have an official variety test. Private companies enter the material there. We test it for a fee. We also test public developed varieties.

The farmer has that test data available to him when he makes his decision. He can listen to the publicity or he can listen to the official variety test. This is used by the Extension Service and by others as a basis for assisting farmers in making his decision.

I mentioned the germplasm and working collection. They are made available to private plant breeders as well as to public breeders.

The other thing that happens in the public sector is that we often release what we call germplasm. This is advanced populations or it may be advanced material into which we have placed disease resistance but it is not good variety material, and we feel that if we can get more people working on it, the quicker we can get a variety in the farmer's hand. So a public release is made from either the experiment station or from USDA or jointly and this then is made available to the private plant breeder or to the public plant breeders, and then that is free to be used in breeding programs and hopefully enhance the breeding cycle, because the ultimate goal is to provide the farmer a better quality seed of higher yield potential.

So I think that if you consider that this interchange that occurs, the working collections we have, that each plant breeder that regardless of whether he works alone or in a commercial company is going to have a working stock of his own. He is going to increase genetic diversity. Therefore, our total genetic diversity is increased.

I have commented basically on soybeans, and it is in the record. I encourage you to read it. It is kind of an historical look at soybeans, how we have come to where we are in soybeans and how I see private plant breeding.

One comment I would say. In 1967, we had about 18 public plant breeders in soybeans. Over the time since the Plant Variety Protection Act, we have added about 35 private plant breeders by various companies.

If you take the current public and private plant breeders added together in proportion to the total of the soybean scientists, there are a lesser percentage of soybean breeders than they were in 1967. So even with the addition of the 35 private plant breeders, we still have a lesser proportion of soybean breeders, because as private plant breeders have come into the picture, we have been able to use public resources in areas of plant disease resistance, entomology, physiology, biological nitrogen fixation, these things that create a better understanding of the soybean plant. Then hopefully evolve back and use the production practices and better varieties as they feed back into the system.

So it has allowed us to redirect some public or to direct additional public resources into areas that private industry probably would not pick up but which is needed to understand our commodities.

Senator STEWART. Let me ask you a question just out of curiosity, and I get this question asked of me at Rotary Club meetings and Civitan meetings. What do you think they would say about the Government intervention into the private sector if I were to say:

> Well, we are just going to cut out all of this research that we do at the experiment stations. We feel like that is an interference in the private enterprise system, and we are going to let you companies do it.

How do you think they would feel about that?

Dr. CALDWELL. Who feel?

Senator STEWART. Private companies that benefit.

Dr. Caldwell. They would not like it. Neither would——

Senator Stewart. My goodness, that is spending taxpayers money to provide a service that they benefit from. I thought they were for the free enterprise system doing those kinds of things.

Dr. Caldwell. They are for the free enterprise system, but the information——

Senator Stewart. But they want the financing of the research about a product on which they make a pretty handsome profit from time to time to be done by the Government sometimes, do they not?

Dr. Caldwell. The product they get is not a product that they use direct. They still got 5 to 10 years investment in the product.

Senator Stewart. But it does enhance that product that they are producing.

Dr. Caldwell. Does enhance it.

Senator Stewart. I will bet you if you had those fellows sitting around a coffee table in a snack bar somewhere they would be raving against governmental intervention in the private enterprise system and just hollering and yelling about how that has just destroyed this economy of ours. I will bet you that way.

And yet they benefit, and not indirectly. They benefit directly from the expenditures funding—is not some of this financed by the Government, some of these experiment stations?

Dr. Caldwell. Yes.

Senator Stewart. Now, what if our statute is concentrating that expenditure into the larger sized companies, what about that? What if that is happening? Why in the world would Ciba-Geigy have to have our help in enhancing the production of a product?

Dr. Caldwell. They may not. Ciba-Geigy, if you are talking about the big companies such as Ciba-Geigy, and there are a number of private industries that have their own basic breeding effort. They have their own plant pathologists. They could do the job. There are some that could do the job.

But the ones that will suffer most would probably be the smaller companies who could not afford a plant pathologist, for example.

Senator Stewart. Well, while we are doing some of this work, let us put some protection for those smaller companies, and let the big boys do it on their own if they have got the capability to do it. Let us make it a little flexible. Let us try to encourage, while we are at it, the enhancement of smaller companies.

I want to give Mr. Loden here more members in his organization and build it up.

Dr. Caldwell. Well, the protection here——

Senator Stewart. And in the long run I want my farmers to have some competition in this area because I just got some price changes given to me, and staff may have to help me, but between 1970 and 1979, I guess the total cost of input into production went up 118 percent. This year the increase is 10 percent. Seeds over that period of time went up 156 percent, and this year the increase is 10 percent.

Fertilizer went up 92 percent, and this year the increase is 30 percent. Fuel went up 167 percent and this year the increase is 50 percent. So seeds do, on the full 10 years or from 1970 to 1979, increase in percentage above what fertilizer cost was but not what fuel cost was, but that almost meets fuel cost. It is 156 percent overall to 167 percent. This year it looks like they are increasing it 10 percent.

So in helping the farmer, we would help him if we made it a more competitive process, would we not, perhaps——

Dr. **Caldwell**. Perhaps.

Senator **Stewart** [continuing]. If we can really believe in that free enterprise system.

Dr. **Caldwell**. If you can provide him a better quality seed that increases his yield or reduces his input costs, then you have helped him in this case.

The one other point that I would like to summarize here, there has been some comments relative to genetic diversity and germplasm exploitation in the United States and other countries, and we have not commented on the role of international centers except as they feel about plant variety protection.

Most international centers have, as a responsibility, such as ICRISAT—International Center for Research for Semi-Arid Tropics—in India or the Rice Institute or whatever, have as a part of their charge the collection and maintenance of germplasm as well as many other research centers.

For example, in North Carolina, we have been concerned with obtaining and utilizing an introduction of peanut germplasm from the center of genetic diversity in South America. We have been supported in these efforts by the International Plant Board for Germplasm Resources, which is an arm of FAO, I believe, and by ICRISAT, located in India.

A part of ICRISAT's responsibility is ground nuts or peanuts. Our joint effort is to assemble and preserve as much material as possible of the species for us now and as a resource for the future.

We are also developing complementary programs so that we do not duplicate what they are doing, so that totally, as they look at their center responsibility for the international germplasm and exploiting peanuts for the developing country, we are trying to assess that and turn that into a benefit to us.

We have also had our scientists working with them, and one of our scientists earlier took a trip into South America on exploration. I just received a report from IRRI—International Research Rice Institute—which indicates they have 40,000 accessions in their germplams bank and information is stored on magnetic tapes and discs, but they have 40,000 accessions in their bank, which they can recall of rice varieties, accessions, types, and genetic material.

So the point I wanted to make is let us not overlook that we have other arms in other countries that are assisting us such as these international centers which we contribute to through our foreign aid program.

Senator **Stewart**. But for security reasons and for this country's own purposes, it would be wise for us to protect as much as we possibly could.

Dr. **Caldwell**. Oh, yes, but we can use these as bridges or as secondary centers to help us work things into this country and as an arm as well as a joint effort to better utilize our scientific manpower.

Senator **Stewart**. Thank you, Dr. Caldwell.

Dr. CALDWELL. One more point. Hopefully we recognize that the act does not lock up or keep genetic material from other folks, other plant breeders, and that plant breeders and public breeders are closely interdependent.

And I did not make the point that public plant breeders are still in business. They are there. They will continue to be there. Some of the people that I know in public plant breeding feel that in many cases that the public plant breeders will still be a pacesetter.

We have to have strong public plant breeding programs not only to develop varieties but where are we going to train plant breeders for the future, and if we do not have strong public plant breeders, then we are in trouble in the longrun just in the discipline area.

Senator STEWART. I think you are right, but some of the questions I ask I have to ask, Dr. Caldwell, as a person who has to play the devil's advocate to give us a good record.

Dr. CALDWELL. Well, I think the point that you made earlier that if we got additional resources that need to be invested, they can really be an asset in germplasm collection and its utilization, just collecting it is not good enough. We need to have procedures to get it into our system, get it into our working collection so we begin to make it available. The sooner we get it into the system the better. I would much rather see those 35 private plant breeders in soybeans working on soybean breeding at private industry expense so that we can use some of our public resources to do some of this exploiting and protecting this genetic base that we have got.

Senator STEWART. Thank you.

Dr. CALDWELL. I thank you.

Senator STEWART. Dr. Lewis?

If you all will pardon me, there has been an accident with a member of my family, and I am going to have to leave. I will allow the questions to be asked by Dale Stansbury.

STATEMENT OF DR. CHARLES F. LEWIS, BRYAN, TEX.

Dr. LEWIS. I am sorry to hear that there has been an accident.

My name is Charles Lewis. I retired from the U.S. Department of Agriculture in June of last year.[1] I served on the national program staff for plant genetics and breeding, and as Dr. Loden pointed out, I was the executive secretary of the National Plant Genetics Resources Board at the time it wrote the report to the Secretary of Agriculture.

My testimony is going to support the passage of these amendments and defend the original Plant Variety Protection Act because most of the objections have been against the original act and not the amendments as such.

The Plant Variety Protection Act was passed as a matter of justice and equity. Plant breeders like others who invent or create useful products by their intellectual efforts deserve a reward for their work.

Plant breeding is expensive if you do it right. It is slow. It takes a lot of scientific knowledge, and breeders who invest time, money, intellectual skill in developing an improved product ought, it seems to me, have more rights to it than those who invest nothing.

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[1] See p. 129 for the prepared statement of Dr. Lewis.

A lot has been said in the House hearings and today about the Plant Variety Protection Act's adverse affect on genetic vulnerability of crops and on the decline of diversity of crop germplasm.

Genetic vulnerability is said to occur because large acreages are planted to a few varieties, but the record will show that large uniform acres may or may not be hit by an epidemic and that very diverse species are sometimes the ones that get hit as the Dutch elm trees are now.

But it is true that as more and more acres are planted to fewer and fewer varieties the old land races or the traditional varieties will be taken out of cultivation. These two concerns, genetic vulnerability and the conservation of germplasm have been the subject of two National Academy of Science reports which you probably know about, and they have been the subject of considerable activity by the Department of Agriculture, the State Agriculture Experiment Stations and the seed industry.

The trends in agriculture, I maintain, that led to these two concerns began a long time before the Plant Variety Protection Act was passed, and my argument is they are not the results of that legislation.

I would submit to you they're the consequence of the discovery of the Mendelian laws of heredity, the discovery of the chromosome as a carrier of hereditary factors and the development of the science of genetics and breeding.

Any fair appraisal of the science of plant genetics and breeding must conclude that there has been a tremendous benefit to this country and to the world. It has contributed to higher yields, better product quality and resistance to pests and environmental stresses.

Opponents of this legislation unwittingly, I hope, seem to be arguing that ignorance of genetics and breeding is preferable to knowledge and that no effort to improve agricultural productivity through genetics is preferable to a vigorous effort.

My main point is that the cause that has been attributed to the act is really caused by the science of genetics and breeding itself.

Now, if you grant that genetic vulnerability and conservation of germplasm are of important national concerns, and I would agree, then the question of the problem of how to cope with that is best expressed in those two National Academy of Sciences reports and in the report to the Secretary of Agriculture.

That report that was made part of your record stresses that the best defense against genetic vulnerability is to have active, vigorous genetic breeding programs involving State, Federal and the private industry.

The genetic diversity we need must be in the backup material, in our breeding programs and in the genetic resource conservation centers. The corn blight epidemic of 1970 was quickly solved because the breeders had in reserve resistant material and they had the ability to propogate that into huge volumes quickly.

The genetic diversity within the varieties and among the varieties that we plant in the fields, in my opinion, is not the best approach to this problem. Farmers in the United States and around the world are not willing and should not be asked to plant inferior seeds to make a personal sacrifice in low productivity as a contribution toward preserving genetic material or toward lowering the chances of an unpredictable and in any case very rare epidemic.

The best place to have that diversity is in the national and international germplasm programs and in the breeding programs of all who engage in developing varieties.

The U.S. Department of Agriculture and the State Agriculture Experimentation Stations recognize the need for preserving germplasm as far back as this Nation is old. There is a document that points that out.

We have been in this business since the beginning of the Nation. It has taken different forms and shapes over the years. The current system, the one that is in place right today, is a network of institutions and agencies involving State, Federal, and private resources, working cooperatively to introduce maintain, and document the characteristics and to distribute germplasm to users.

This system that we are trying to put in place has, as its characteristics, fixed responsibility for the maintenance of germplasm in the public interest. The keepers of the germplasm do not have the authority to throw it away on their own initiative. There is a board of directors sort of committee that manages that.

It is characterized by funding and administrative planning that can direct moneys to different elements of the system. It is developing a computer assisted information program so that people can know who has what where and what they know about it. It is marked by free availability of any of this material to scientists and breeders. By "free" I mean you can get it and you do not have to pay for it.

It is able to cooperate with other national and international bodies engaged in this same kind of activity around the world. Now, this is in marked contrast to just sort of let nature do it where there is no fixed responsibility and a terrible record of losing material as the years go by.

The system we have is not perfect, and it does need a lot of strengthening yet it is a good system. I think Dr. Jones said it is probably the best system in the world, and it is the envy of many nations and other groups within the United States.

It has in its custody hundreds of thousands of samples of seeds and each year, on request, it supplies thousands of samples of seed to research people in the United States and around the world.

There has been a lot said here about prices of seeds, and you are trying to get hard data as to what the Plant Variety Protection Act had to do with that. I would submit that is going to be pretty hard to cost account precisely like that, but it seems obvious to me that inflation in general has accounted for the high cost of seed much more than this act might have had.

But I want to make this point. Good seed not only costs more but they are worth more than poor seed. It is money well spent to buy seeds that meet the seed certification standards for genetic purity, for germinability and freedom from weeds.

If you spend your money on seeds that will not come up and you get a crop of weeds, you are not very far ahead, but lest we confuse issues still again, let me point out that seed certification applies equally to protected and unprotected varieties. This is really irrelevant to this issue.

It has been said that seed should not be an item of commerce such as car and refrigerators—I guess the Catholic bishops would maintain that—on the grounds that these are mechanical things that we could, in the final analysis, do without, but seeds are a source of our food supply, and therefore, should not be an item of commerce.

The seed in these public germplasm centers in this country and in the world are national and international resources. These seeds are freely exchanged without charge for research and breeding purposes.

The reason for that is a handful of seed, just a little bit, is all that the research person needs to get started, and the Government, the taxpayer, can afford to provide seeds in those quantities and meet that demand.

But if farmers and gardeners are to have the tons and tons of seed they need to plant the huge acreages we devote to cultivation, somebody has got to produce that seed. If you produce that seed, you have to do it at considerable cost and at great financial risk oftentimes.

I do not think it is inconsistent with our national philosophy that needed goods and services can be supplied by industry for a reasonable profit, but again the forces that are leading to the concentration that has been alluded to, in my view, are much more the forces of the business world and not the forces generated by this act.

Now, the farmers of this world desperately need a dependable and adequate supply of good planting seed. In my opinion, they cannot depend solely on saving their own seed or exchanging with their neighbors.

The Plant Variety Protection Act certainly does not prevent that. They can do that if they please, but farmers have discovered that they must occasionally go back to the originating breeder for a fresh start of seed, otherwise the farmer term is that it runs out and they start getting poor crops.

The reasons for the deterioration or running out are well known and can be prevented by knowledgeable people following scientific practices. This is another vital function that the seed industry in plant breeding provides.

Calls have been made for additional studies. It seems to me that we have had study on top of study already by the international groups, by the National Academy of Sciences, by the Secretary of Agriculture's board, and you can always say we should not do anything until we study some more.

But even if additional studies were made, it would be very difficult to focus on what we are discussing and not let it digress, as this hearing has, into discussions of the Plant Variety Protection Act as a philosophical principle around the world, the impacts of inflation and the trends in the business world.

So I do not think additional studies are going to add very much to the body of knowledge that you already have.

In conclusion, sir, I believe that these amendments should be passed as a matter of justice and equity to the breeders of the six vegetables. It makes no sense to me to deny the breeders of those six vegetables rights which breeders of all other crops have.

If you have questions, I would be glad to try to answer them.

Mr. **Stansbury**. Let me just followup that last point. What would happen if they are left out?

Dr. **Lewis**. Not very much. That is, I think, the amendment is, I would not want to say trivial, but the world is not going to come to an end if you pass it or you do not.

Mr. **Stansbury**. Why were they excluded originally?

Dr. **Lewis**. I do not know. The objection came from, as I understand it, the big soup companies who thought it might somehow interfere with them. I understand now they do not have that fear any more, and so the original political compromise is no longer necessary.

Mr. **Stansbury**. Would you contrast the flow of genetic information before and after the act among the various international researchers?

Dr. **Lewis**. As far as I can see, this act has had negligible influence on the flow of information about germplasm.

Mr. **Stansbury**. So has there been any change at all in the free flow of information among researchers as a result of the act, positive or negative?

Dr. **Lewis**. None that I could document.

Mr. **Stansbury**. Inasmuch as those were the questions that Senator Stewart had I have nothing more.

I thank you both, Dr. Caldwell and Dr. Lewis.

Our next panel is Mr. Doyle, Mr. McCurry, Ms. Nelson, and Ms. Anderson.

Now, let me say it will not do you any good to talk to me particularly. Senator Stewart will be reading each of your statements. I would suggest that you briefly put on the record anything additional that you might want to say in response to the other testimony or things that you have thought of as you have heard it, and then I have some questions that Senator Stewart had prepared, and I will ask those.

STATEMENT OF KATHARINE ANDERSON, DIRECTOR, BOTANICAL GARDENS PROJECT, GARDENS FOR ALL, BURLINGTON, VT.

Ms. **Anderson**. My name is Katharine Anderson. I am here representing Gardens for All. We are a national membership organization for home and community gardeners, and we feel that the 33 million gardeners out there ought to be represented in these hearings.[1]

We have consulted everything we could get our hands on trying to figure out what we felt about the legislation. We have no vested interest in either side of this. Our relations with the seed companies have always been positive and we feel they are protecting their economic investment, that is, as far as we are concerned, perfectly valid.

We are concerned about some other issues which we feel may be important to the rest of us in this country. Our main conclusion is that an impartial study is absolutely essential before anything is done on passage of this amendment, not because these six vegetables hold the key to our agricultural future, but because we have had 10 years of patenting in this field, and it is important that we look at what has happened.

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[1] See p. 132 for the prepared statement of Ms. Anderson.

Listening to the testimony here again today, there are a lot of statements which have no basis in fact because specific studies on some of the questions have not been done.

This is all in writing so I suppose there is no need to go through each point. We just want a look at exactly what has happened, who holds patents, what size companies hold the various patents.

We have not seen a listing of all the patents that have been issued, who owns them, and whether they are small or large. There is some question on what a small company is as well.

There are various people who benefit from the legislation. We would like to see these various benefits identified. Clearly the seed companies are benefiting economically. We would like to see how the consumers are benefiting, whether they are getting a higher quality or wider variety of seeds.

It may involve evaluating the new seed varieties that have been introduced since the 1970 legislation differ from each other. There are scientific bases for doing this seed variety evaluation. We do not have the facilities to do that, but there are groups that do.

Another question relates to patenting in general. As we understand it, when a patent is issued to someone under our standard patenting laws, the process by which an invention was developed is made public, and we are aware that when people do apply for a patent for a plant variety, they have to supply the breeding records to the Plant Variety Protection Office.

There is nothing in the bill itself which provides for making that information public, We would like to know what, in fact, happens to the information. Is it readily available and freely exchanged?

Mr. **Stansbury**. Excuse me. Would you mind making a statement to that effect? I think you could do that.

Mr. **Leese**. Yes. She asked the question about the size of the companies and the number of companies, and I did furnish that previously.

Mr. **Stansbury**. I am more interested in what happens to the information. Is it made public?

Mr. **Leese**. The information is stored, and this information is available to the public. The only time it is confidential information is during the searching of the certificate. After the certificate is issued, the information is available to anyone who wants to get the information for their records or for their breeding purposes.

Ms. **Anderson**. And they get that by request?

Mr. **Leese**. By request, yes.

Ms. **Anderson**. Our other main point is that we have seen no new evidence here that would clarify our main questions, and a study is essential. It should be conducted by a group which is not directly benefited either way. Thank you.

STATEMENT OF JACK DOYLE, WASHINGTON REPRESENTATIVE, ENVIRONMENTAL POLICY CENTER

Mr. **Doyle**. Sir, for the record, my name is Jack Doyle. I would like the full content of my statement to be printed in the record.[1] I will highlight one part of that statement having to do with a survey that we completed of some of the patent certificates issued in 1975, and I will read from that section of the statement.

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[1] See p. 133 for the prepared statement of Mr. Doyle.

We recently reviewed some of the data on plant patent certificates found in the official journal of the Plant Variety Protection Office—and I have a stack of those journals here for a number of years. Our survey is a random, unscientific examination of 72 new agricultural crop varieties for which patent certificates were issued by the U.S. Office of Plant Variety Protection during a 9-month period between May 1975 and December 1975.

We looked at the distinguishing or novel features of those varieties as identified in the official journal and we grouped those characteristics as follows for the 72 certificates issued, and these were the characteristics that were mentioned and the number of times they were mentioned:

Color of seed—mentioned seven times. Physical differences in shape, size or appearance of seed such as being wrinkled or smooth, oblong, et cetera—mentioned nine times. Characteristics having to do with size, weight, shape strength, appearance of the fruit, fiber, kernels or pods, for example, descriptions such as, "serve-size peas", or "semihard kernels," those kinds of characteristics were mentioned 22 times.

Tolerance to plant blights, leaf rusts or plant viruses—mentioned two times. Resistance or moderate resistance to plant blights, leaf rusts or plant viruses—mentioned 13 times.

Resistance to root rot—mentioned one time. Resistance to nematodes—mentioned one time. Resistance to pestilence—mentioned one time. Susceptibility to plant blights, leaf rust or plant viruses—mentioned four times.

Resistance of certain parts of a plant, for example, cotton bolls, to storms or storm damage; that was mentioned four times. General physical characteristics of plant such as size, weight, height, leaf shape or shape of the leaf—mentioned 32 times.

Maturity of plant, for example, maturing earlier or later or, "heads 2 days earlier," was a typical phrase found describing that characteristic—mentioned 25 times. Whether the plant would, quote, "lodge" or lean toward the ground, whether it had more or less lodging resistance et cetera—mentioned three times.

Chemical composition or chemical characteristics of a plant—mentioned one time. Color of plants flower or color of fruit kernels or hulls—mentioned nine times. Restoration of fertility to hybrids—mentioned two times.

Among the 72 new varieties and all the distinguishing features mentioned for these varieties, there was only oblique reference made to flavor and no mention whatsoever of general nutritive value or how much or how little fertilizer, herbicide, water or energy any of these new varieties might require or might displace.

And while the foregoing survey may not be scientific in its methodology—it is a random survey—it does indicate to us that the overwhelming distinguishing characteristics cited for new plant varieties turn out to be those related to plant color, size, durability, harvestability, plant maturity, et cetera.

Characteristics that are nonfunctional such as color of seed or markings on the seed, et cetera, are characteristics which facilitate mechanized harvesting, processing, shipping or have some appealing characteristic for consumers that does not necessarily relate to nutrition were mentioned quite often. In fact, nutrition is rarely, if ever, mentioned.

Now, while we recognize that the criteria in the law do not focus on flavor or nutritive value, it is, nevertheless, interesting and it would be useful for, I think, the public to know how many—if a breakdown in data for the kinds of plant varieties patented could be completed so that the public could be shown these various characteristics and categories for each variety. Our choosing 1975 was a random choice, and we do it here more to encourage the Department of Agriculture to make this kind of breakdown on its issued certificates.

The only other thing I would like to add to the record in addition to my statement is a letter that was submitted to the House side from a resources agency of California, and it was signed by Hugh E. Johnson, secretary for resources, Priscilla Grew, director of the department of conservation and Robert Judd, director of the office of appropriate technology. The letter is dated May 2, 1980.[1]

In that letter from public officials in California they made two recommendations which I think should be highlighted here for this record. One was to initiate a study of the impact of consolidation in the seed industry and of the integration of the seed and agrichemical industries on diversity and susceptibility of agriculture in both developed and developing economies.

Another recommendation they made:

> Assure the public, through a statutory guarantee that the United States will not now or in the future seek to ban or otherwise restrict the development or protection of nonpatented varieties as is now the practice in parts of Europe.

And as I say, this is a rather lengthy letter, but those two recommendations, I thought, deserve highlighting here. Thank you.

Mr. STANSBURY. I have been advised that Senator Stewart is not going to get back, and he would like to hear this. He would try to reconvene the hearing in the future. The question is are there any of the remaining witnesses who would have problems with coming back because of distances or transportation problems and would like to make any comments for the record at this time, and if they would, we would be happy to have those now. If not, we will be adjourning until Senator Stewart has the opportunity to reconvene the hearing.

Mr. McCURRY. I have a question. You said he would like to. That is an assumption that he may not.

Mr. PUTT. May not what?

Mr. McCURRY. Convene this hearing on this particular piece of legislation.

Mr. PUTT. Yes, he will, absolutely. We will finish the hearing. The question is whether or not you all want to speak to him, and I know he would like to hear from you personally. And it is just unfortunate circumstances he cannot be here, but as long as everyone can conveniently reconvene, absolutely the hearing will go on.

Mr. STANSBURY. Ms. Nelson, I think you are from Montana.

Ms. NELSON. No. I am from the Washington office.

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[1] See p. 189.

Mr. Stansbury. You are from Washington. All right. Is everyone from Washington?

Mr. Doyle. Yes. I have no problems with reconvening this.

Mr. Dunner. Sir, my name is Donald Dunner with the American Patent Law Association. While I am from Washington, Mr. Williams, who is with me and who is an essential member of our testifying team, is from Kalamazoo, Mich., and it would be inconvenient to do that.

Mr. Putt. Would it be possible to get in touch with you in the future to see when you might be able to come back?

Mr. Dunner. We will do everything we can to accommodate you.

Mr. Putt. In other words, the committee would try to accommodate you as well as to when we would reconvene this hearing.

Mr. Stansbury. Mr. Williams, if you want to make some statement, we would be glad to receive it for the record, and if you felt you needed something additional, you could come back later or we would make some kind of arrangements to meet with you.

Mr. Dunner. If we could make 2 minutes' worth of a statement, and then you can decide whether or not you want us to come back. I think that would be very helpful.

Mr. Stansbury. That would be fine. We would be happy to do that. We appreciate the panel's understanding in this situation.

STATEMENT OF DONALD DUNNER, PRESIDENT, AND SIDNEY WILLIAMS, CHAIRMAN, COMMITTEE ON PLANT VARIETY PROTECTION, AMERICAN PATENT LAW ASSOCIATION, ARLINGTON, VA.

Mr. Dunner. Mr. Chairman, my name is Donald Dunner. I am president of the American Patent Law association. Mr. Sidney Williams with me is chairman of the plant variety protection committee of the same association.

We have a statement which I would like put into the record, I would just like to supplement the statement with three very brief points in response to testimony I heard today.[1]

I have heard today, and I have heard previously at the House counterpart hearings to these, arguments of the "sky is falling" type. We are going to have extinction of germplasm varieties. There will be genetic uniformity and what-have-you.

Those very same arguments were made in a case which received national prominence in this mornings' newspapers and in yesterday's television and news broadcasts—*Diamond* v. *Chakrabarty*, involving the patenting of a microorganism. The Supreme Court considered exactly the same arguments and was not persuaded by them.

The Court even resorted to quoting Hamlet; "It is sometimes better to bear those ills we have than fly to others that we know not of," which is how it summarized the arguments of the adversaries.

We consider these exactly that, "sky is falling" arguments. They have been made for centuries, and they are no more valid today than they were before.

Point 2. The question was raised by the representative of the National Sharecroppers Fund that various people are opposed to the patenting of life forms or the equivalent. That is exactly what the Supreme Court decided yesterday; that it was proper, and all the arguments that are involved in that case would be equally applicable here.

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[1] See p. 142 for the prepared statement of Mr. Dunner.

The next point is the question of large companies versus small companies. Senator Stewart raised this question while he was here. It is true that large companies can, by and large, do better in a given situation than a small company if no party has a patent.

But the fact is that large companies need patents vitally. It affects their research dollars. A company like Ciba-Geigy will put its money into an area where it can get proprietary rights rather than where it cannot. I think it is vital with large companies as well as with small, though it may even be more vital with small.

Lastly is the study concept. We have studied this to death. Our paper has reports of studies in it. There is a 1976 study which is referred to by one organization, and there are other studies referred to. If we study this, we will be studying this in 1990, and we will never have an act.

If you have any questions, fine. Otherwise, we would be prepared to come back.

Mr. STANSBURY. Thank you.

Mr. Williams, did you want to add something?

Mr. WILLIAMS. Thank you, yes. First, I would like to point out that the whole system of patents and plant variety protection has a constitutional basis, spelled out in article I.

And as Mr. Dunner has indicated, there has been some concern that this constitutional base does not provide something which you could base patenting of plants on. I think the Congress decided back in 1970 that this was an adequate basis in passing the law.

Let me address the concern that the food supply was not intended to be endangered by patent legislation. Well, I think there is an important safeguard in the Plant Variety Protection Act. I would just like to draw the committee's attention to section 44 of the act which gives the Secretary the right to decide whether or not prices are too high with respect to seed and that if there is not an adequate supply of certain food or fiber, he can, in fact, make that an open variety. So I think that there are some built-in safeguards against that particular concern.

The concern on genetic preservation and genetic diversity I think is well fortified in the act. There are at least two sections in the statute. I would like to draw your attention to section 83(c) of the statute which says that if a plant variety protection certificate holder does not maintain that supply, there will be a premature expiration of his certificate.

Section 122 of the statute refers to section 52. Section 52 requires a declaration that the genetic supply will be maintained. Section 122 states that a plant variety protection certificate can be held invalid for failure to comply with section 52. Thank you.

Mr. STANSBURY. Thank you. The hearing is adjourned until Senator Stewart has an opportunity to reconvene it. We appreciate everyone's efforts and assistance.

Thank you.

[Whereupon, at 12:37 p.m., the subcommittee recessed, to reconvene Wednesday, June 18, 1980, at 8:40 a.m., in room 324, Russell Senate Office Building.]

PLANT VARIETY PROTECTION ACT

WEDNESDAY, JUNE 18, 1980

U.S. Senate,
Subcommittee on Agricultural Research
and General Legislation of the
Committee on Agriculture, Nutrition, and Forestry,
Washington, D.C.

The subcommittee met, pursuant to recess, at 8:40 a.m., in room 324, Russell Senate Office Building, Hon. Donald W. Stewart (chairman of the subcommittee) presiding.

Present: Senator Stewart.

STATEMENT OF HON. DONALD W. STEWART, A U.S. SENATOR FROM ALABAMA

Senator **Stewart**. If we could have your attention, we will get the hearing underway. We have Dr. Charles F. Lewis, Jack Doyle, Ginger Nelson, Katharine Anderson, and Donald Dunner. Do you all want to step up, take your places, and present your testimony? I've got some questions I would like to ask you.

Dr. **Lewis**. I gave mine, but I would be glad to repeat to you, sir.

Senator **Stewart**. Oh, I apologize. It was indicated to me you were going to give your testimony today.

Dr. **Lewis**. If you have any questions.

Senator **Stewart**. Well, if you will take a seat, and then we will hear the panel.

What could you add in response to some of the claims that have been made with regard to this particular piece of legislation? Let's center on this particular piece of legislation.

STATEMENT OF DR. CHARLES F. LEWIS, BRYAN, TEX.

Dr. **Lewis**. Well, Mr. Chairman, it seems to me that the issue boils down to the question of whether or not plant breeders, like other individuals who create inventions or compositions or books that can be protected by patent or copyright, deserve a right to their labor and intellectual products. I would contend that they do, because plant breeding is expensive, it's time consuming, and it requires a lot of scientific and technical skills.

And without the protection of this Plant Variety Protection Act, the breeder of a variety has no legal basis in law to keep somebody who invests nothing from capitalizing on that development. With it, you have legal grounds for a lawsuit if they infringe.

Now, the beauty of this law is that it is not mandatory. If you don't believe in plant protection or don't think you need it, you don't have to apply. But under today's law you have that option—it's open to you, whether you want it or not.

And it would seem to me there's no sense at all to deny that right to breeders of [inaudible] vegetables while extending it to breeders of all other crops.

Another thing. Yesterday there were all sorts of analyses of the size of the company, the characteristics of varieties that had been protected. Hard information on protected varieties is not going to be worth very much, in my opinion, because it ignores the fact that a great majority of varieties released in this country are not protected; they choose not to apply.

Therefore, an analysis of protected varieties is nearly meaningless.

Senator **Stewart**. In other words, it wouldn't cover the waterfront at all.

Dr. **Lewis**. No, it's a small part of the total effort.

Senator **Stewart**. Well, of course, to say that the patent system doesn't work and to argue against it, and then say that you ought to just take a look at those that are covered by this patenting process and not take into consideration those that are not covered by it would be having both sides of the argument in a way, wouldn't it?

Dr. **Lewis**. I'm not sure I get your point.

Senator **Stewart**. Well, they argue that not having the patent process, you would just release it without any protection, and yet they don't want us to take a look at those varieties that have been released without protection, and they make the argument that the patent process doesn't work.

What I am understanding you to say is that there are plenty of varieties that are released that are not protected, is that correct?

Dr. **Lewis**. Yes, that's right.

Senator **Stewart**. Well, if you are right, we would have to take a look at both.

Dr. **Lewis**. You would to get a complete analysis.

Senator **Stewart**. I notice here that you participated in the writing of a National Academy of Science report, "Genetic Vulnerability of Major Crops."

Dr. **Lewis**. Yes, sir.

Senator **Stewart**. When did you do that?

Dr. **Lewis**. I think that report was issued in 1972, if my memory is correct.

Senator **Stewart**. What crops were you talking about at that time?

Dr. **Lewis**. I was on the committee that wrote about cotton.

Senator **Stewart**. Did you find that we were vulnerable in that area, that we perhaps had some difficulties in cotton?

Dr. **Lewis**. We haven't had anything in cotton comparable to the corn leaf blight epidemic.

Senator **Stewart**. I mean, was there some problem in cotton?

Dr. **Lewis**. Well, the only thing in cotton is a few varieties tend to dominate the acreage in the United States.

Senator **Stewart**. Well, would that make us vulnerable from the genetic standpoint?

Dr. **Lewis**. From—I guess you would say—almost a philosophical point of view, if you plant huge acreages to the same genotype we call it, or the same kind, if a disease or an insect comes along that can attack that, when one plant becomes susceptible, they all do. Therefore, the potential for an epidemic is enhanced.

Senator **Stewart**. Well, how do you protect yourself as a nation against that kind of thing with regard to cotton or soybeans or——

Dr. **Lewis**. I hope you will have time, Mr. Chairman, to read that report to the Secretary that Dr. Loden gave you yesterday, because that is analyzed very carefully in there, and it is part of my testimony, that the best defense against that is to have in our seed storage facilities good samples of the variability—in this case, of cotton and [inaudible] in the world—and we do have a tremendous reserve of the old primitive stocks. The otner thing is to have——

Senator **Stewart**. Let me ask you this. Let's say you had an epidemic and you had a catastrophe in that, how long would it take you to develop a new strain, a new variety, that would be disease resistant. I mean, even though you had it in storage, even though you had it available to you, how long would it take you to develop it?

Dr. **Lewis**. If you had to go all the way back to an introduction, let's say from Central America, and start from scratch and bring it up to release, it might take you 15 to 20 years.

Now, the point of this bulletin is that we should have active breeding programs, bringing these things along; the pipeline should be full.

Senator **Stewart**. Do we have?

Dr. **Lewis**. Well, yes—yes and no. I mean, you know, you never have everything as——

Senator **Stewart**. Oh, I understand that, but I am concerned about whether or not we have those types of programs ongoing.

Dr. **Lewis**. Yes, we do.

Senator **Stewart**. At the experiment stations and other——

Dr. **Lewis**. The book points out a shared responsibility between the Federal Government, the States, and industry. It seems to me that the Federal Government is uniquely qualified and obligated to look in those old collections, find an insect-resistant or disease-resistant or drought-resistant, whatever, even though you may not be having a problem at the moment that's an epidemic like you suggest, work out the genetics of that, and get it over into reasonably good producing stocks.

Senator **Stewart**. Is that what Mr. Loden was talking about yesterday when he discussed the fact that there was a narrow genetic base underpinning soybeans, corn, those sweetpeas? Is he saying that we do not have an adequate amount of activity ongoing in the breeding and releasing of new varieties in those areas? Is that what he is talking about?

Dr. **Lewis**. I'm not sure what Dr. Loden had in mind, but——

Senator **Stewart**. Well, he suggested he was part of a committee that recommended $10 million of work in that area, because they feared something of the nature I guess of what you are talking about, where the varieties that are now being used, or fairly commonly used, and apparently they don't have much activity going on in those areas. It would be surprising to me that they wouldn't have in soybeans, particularly because they grow a lot of soybeans.

Dr. **Lewis**. They grow a lot of soybeans, but Red China has been closed to us for so many years. You might be interested to know that the Russians gave us several thousand samples of soybeans that they had collected around the world. That was one positive benefit of this Russian-United States agricultural agreement. We did get a beautiful collection of soybeans from them just last year.

Senator **Stewart**. Well, let me thank you for your testimony. There may be some further questions I would like to ask.

Dr. **Lewis**. Could I make one last comment?

Senator **Stewart**. Yes, you may.

Dr. **Lewis**. You yesterday seemed to be concerned that the Department started a study of this in January of this year. Let me assure you, Mr. Chairman, that the Department of Agriculture has had a program since it started. As a matter of fact, this Nation was concerned about this problem as early as its very Founding Fathers, and this——

Senator **Stewart**. I was just concerned—and I know that oftentimes, Dr. Lewis, it doesn't have a thing to do with the Department necessarily; their intentions may be to do everything that is needed to be done in this particular area. The administration or Congress may just not see it that way and may not recognize the significance of what you are doing. Very frankly, I doubt very seriously if you took a poll in the U.S. Senate—some of them may be a little bit better read than I am in this particular area—but other than Members of the Agriculture Committee who perhaps come in contact with it, you are not going to have many people who understand what you are talking about in the first place.

Dr. **Lewis**. This is the reason this budget process is so difficult. I have served in Washington for 21 years and I don't know how many of those years we prepared at the outset a very hopeful budget for this kind of work. We would always enter the budget process with great enthusiasm. But before it really comes out the other end, it gets scuttled in Agriculture, OMB, or the Congress, and we either get nothing or very little.

Senator **Stewart**. That's the only thing I was concerned about.

Dr. **Lewis**. I frankly couldn't learn in 40 years how to beat that game. This is not a very glamorous work.

Senator **Stewart**. Oh, I recognize that. I was talking to a reporter about what we were doing yesterday—and they are not going to print anything about it.

Dr. **Lewis**. If you talk about going to the Moon or making cheaper energy or saving the environment or feeding the poor, these have appeal—or even certain types of medical research.

But so far the American people don't line up at food stores to buy their groceries like we lined up for gasoline at one time, and I am beginning to wonder if we are ever going to wake up until we do.

Senator **Stewart**. Well, I hope we don't have to get to that point. I think you are probably right.

Let's proceed with the next panel, if we can. Thank you very much.

Dr. **Lewis**. Thank you, Senator, for the chance to come up.

Senator **Stewart**. We appreciate it. Will the next panel take their place up here.

Mr. Jack Doyle and Dan McCurry, Ginger Nelson, Katharine Anderson, and Donald Dunner.

Would you all please identify yourselves and then briefly summarize your testimony. I apologize for having to leave yesterday and create an inconvenience for you all.

STATEMENT OF JACK DOYLE, WASHINGTON REPRESENTATIVE, ENVIRONMENTAL POLICY CENTER

Mr. DOYLE. Mr. Chairman, we thank you for reconvening this committee to hear us.

I am Jack Doyle with the Environmental Policy Center. We are a public interest organization. We work on energy policy basically in the U.S. Congress.

Senator STEWART. Are you all going to take responsibility for the energy package we just passed?

Mr. DOYLE. No, Mr. Chairman, we are not.

Senator STEWART. You all weren't pleased with that?

Mr. DOYLE. Certain portions of that package were not to our liking. We would much prefer to see a crash program in conservation than some of the synthetic fuels policies that are being offered.

Senator STEWART. Well, sometimes I think that I would, but you have to deal with the real world sometime; we have some people who feel the other way.

You can proceed.

Mr. DOYLE. We have several points we would like to cover as to our position.

Senator STEWART. And I don't mean to slight your position; you may be dealing with the real world, we may just think we are dealing with it.

Mr. DOYLE. Well, we do attempt to moderate our position on certain issues.

Senator STEWART. What is your concern about this legislation?

Mr. DOYLE. Well, we feel that there has not been adequate oversight in the Congress on the seed issue since 1970, and there has been a lot of new information developed since 1970.

Senator STEWART. Like what?

Mr. DOYLE. Well, for example, the energy crisis was not considered—well, Congress did not and could not foresee the energy crisis when we embarked on this Plant Variety Protection Act in 1970.

Senator STEWART. How does that relate to the Plant Variety Protection Act?

Mr. DOYLE. Well, the information that I think is lodged in seeds has a bearing on the kinds of agricultural systems that grow up around seeds and on farms, and genetic information I think has a bearing on the types of energy requirements that one would have on farms.

Senator STEWART. Well, I'm having difficulty following that. How about explaining that?

Mr. DOYLE. Well, if you breed certain kinds of seed for harvestability, for example, or for sturdiness, and those traits are related to the kinds of machinery that you use, and the kinds of machinery that you use on large farms——

Senator STEWART. Oh, in other words, you say that mechanization of the farm causes us to breed certain types of plants that might create problems for us when we get into the energy crisis?

Mr. Doyle. Well, I am saying that harvestability, that characteristic, inasmuch as that is considered in a breeding program, will have some bearing on energy requirements on farms.

Senator Stewart. I see.

Mr. Doyle. So that factor has not been considered in the debate, or it was not foreseen by Congress in 1970.

Senator Stewart. Well, how does the Plant Protection Act cause that to take place?

Mr. Doyle. I am not saying that the Plant Protection Act causes that to take place. I am saying that in the review—with the enactment of the Plant Variety Protection Act in 1970, this information was not foreseen, could not be foreseen—for example, the energy situation.

Senator Stewart. Well, what relation does the Plant Protection Act have, though, to that?

Mr. Doyle. I am just saying that the energy situation is an element that was not considered at the time of enactment, and that we are now considering some amendments to that act, and if we are in a position to learn more about how the breeding program can save us energy, then we ought to consider that, in review of these amendments.

And our position is that we should take a real hard oversight look at the legislation, comprehensive oversight.

Senator Stewart. Well, you may be correct, but I still haven't gotten the connection. And I will ask again how you connect what was bred, what took place, with the enactment of the Plant Protection Act? Can you relate it to that?

If you can show me that we bred seed that was more harvestable and sturdier because of the Plant Protection Act and not because of the research that was done in the area of mechanization, I would like for you to do it for me.

Mr. Doyle. OK, we would like to put a question to USDA asking if they can identify varieties in terms of their energy requirements, how many patented varieties, what kinds of on-farm energy requirements are attributed to its patented varieties?

Senator Stewart. Well, I just don't understand how you are making the connection. You are laying at the feet of this Plant Protection Act the fact that sturdier plants or more harvestable plants were bred. You may be right that those who bred the seeds did so because there was a mechanization process that was taking place on the farm. I don't know what in the world that would have to do with the Plant Protection Act.

Now, if you will make that connection for me—if anybody on the panel can make the connection for me—I would like to have it, because I personally right now——

Mr. Doyle. Mr. Chairman, I would just like to raise that question: Is there—I mean, one of the problems with this whole issue of plant variety protection and plant patenting has been the lack of aggregate data on a number of questions.

Senator Stewart. Well, you may be correct that we haven't—I think you probably are—that we have bred seed that would produce plants that would be harvestable by machinery. Hasn't that taken place?

Mr. **Leese**. This has taken place, and I think if a variety was produced that couldn't be harvested by machinery, it would soon lose favor to the farmer, because it couldn't be harvested properly and would be out of competition with other varieties.

Senator **Stewart**. I would think that that would be because of the mechanization of the farm, not because of the plant patenting process. Now, the same people may have participated in the research that led to the mechanization of the farm that are now producing the seed. There seems to be a connection between those two, that would seem to me to be the most logical approach to take.

I have noticed that there are some people who are involved in energy production—fertilizer production, agribusiness, from that standpoint, who are now also going to become involved in seed production. Is that what you are saying?

Mr. **Doyle**. Well, that is exactly what I was about to say, that insofar as we were talking yesterday about some of the petrochemical interests and energy companies that have been given patents—Occidental Petroleum, and some of the other corporations that had been mentioned yesterday.

Senator **Stewart**. Are you saying that the patenting process, though, allows that to take place to the detriment, say, of the small seed producer. What's to keep, under this patenting process, the small seed producers from raising a variety of a plant that is harvestable in another manner, and what is in the patenting process that keeps them from doing that?

As I understand it, from listening to Ms. Schlei, she indicates that any farmer can do it—or any small seed producer can do it—but there is no real element there in the law itself that will prevent them from doing it. It's a fairly simple process, filling out a paper, a few papers—of course, I assume the research would have to be the same, you would have to spend time and the money and invest. But short of this Plant Protection Act, what would a small fellow who got into that process have in the way of protection to prevent some large-size concern from taking his—say his variety became very successful, how could he protect that? Short of this act, how could he protect it?

Can anyone at the table tell me that?

STATEMENT OF KATHARINE ANDERSON, DIRECTOR, BOTANICAL GARDENS PROJECT, GARDENS FOR ALL, BURLINGTON, VT.

Ms. **Anderson**. I'm Katharine Anderson from Gardens for All. We are a national membership organization for home gardeners.

What I would like to say is that in intent the act doesn't prevent anybody from doing anything of the sort. What we are asking is: Is it working, is the mechanism working, is the patenting benefiting the small company? Certainly, as it is written, nothing prevents anybody from taking advantage of patenting rights.

Senator **Stewart**. What evidence do you have that it is not working? I mean, when you make charges that it is not—and I assume it is implied in your testimony that it perhaps is not—I haven't read it, but will—but tell me just in some fairly simple terms so even I can understand it what's happening with it that you are concerned about?

Ms. **Anderson**. Our testimony doesn't make charges. We are a concerned group; we are here because we have been reading a lot of information about this gathered by different groups——

Senator **Stewart**. Oh, I don't blame you for being here; you may be doing a service. I commend you for being here.

What I want you to tell me is what you think is happening as a result of this act that is detrimental to the small seed producer, to the farmer, to agriculture—tell me, that is what you are here for.

Ms. **Anderson**. OK. I think I would like to have him finish his testimony rather than go into that right this minute. I was responding to that one question, about the intent of the act.

Senator **Stewart**. I would like to have you tell me what you think is bad about the act.

Ms. **Anderson**. OK. You haven't read my testimony yet, I guess you will.

Senator **Stewart**. How about summarizing it for me? If you feel strongly about it, then you can tell me without looking at your testimony or anything else what's wrong with it.

Ms. **Anderson**. We are concerned about seed prices to home farmers.

Senator **Stewart**. The increases, is that what you are——

Ms. **Anderson**. We are concerned about the increases in seed prices, yes. People were discussing the sugar snap pea, for instance. I buy sugar snap peas for my garden; I found them to be quite a lot more expensive—it's much more than 16 cents a pound extra at the retail level. Now, granted, it's a fine crop, and I have grown them before and I like them. But if that is going to be happening to the patented seeds that are introduced, that is something that I would like to have considered before the amendment is passed. And we have 10 years' worth of patenting legislation to look at, to see what has in fact happened.

Senator **Stewart**. Are you saying that the seed prices, or the increase in seed prices, has been caused by the patenting process?

Ms. **Anderson**. I would like to know if it has.

Senator **Stewart**. If it has been, OK.

Ms. **Anderson**. I have not been able to determine from the information I have obtained whether it has or not.

Senator **Stewart**. I hate to get involved with you in a discussion of semantics, but that is a charge. You might not think it is, but that is a charge that the program doesn't work, or at least creates something that is not good in the process.

Ms. **Anderson**. Or that there are indications that it might, at least, and we would like to have that checked out.

Senator **Stewart**. OK. What else are you concerned about?

Ms. **Anderson**. We are concerned about the varieties that are available to home gardeners.

Senator **Stewart**. The loss of varieties?

Ms. **Anderson**. The discussion yesterday seemed to center mostly on varieties for commercial vegetable production, not ones that are designed for the home gardener and the small farmer. Now, I don't even know what proportion of the seed trade is concerned with the small gardener; we haven't been able to figure that one out.

Senator **Stewart**. Don't you think, though, that in the process of protecting a patent—I just throw this out as a hypothetical—if there is a market in the home gardening area, if there is a market in the small farm area, that a person could under this act take advantage of and work and spend his time and effort and make that seed available. If there is a market there he's like a specialty operation in the steel business. Republic Steel or United States Steel produces, you know, a large size amount of steel for big large-size users, and then you have got specialty steel companies—and the large ones are having an extremely difficult time now, but the small ones are going to new technologies, they have carved out a market for themselves, specialized in that area, and have developed a real lucrative business.

If you represent a large-size group of people, then a person would have, I would think, available in this statute something that would merit his investment in raising a new variety that would be popular with gardeners and popular with small farmers.

Once a company got that variety developed—how would it protect that investment? Because I would assume the large-size fellows would say, well, you know, he's found a new market there, and let's just—I don't know how they would take it away from him, I don't know that much about it, but it would seem to me that they could do that.

Ms. ANDERSON. Again we are talking hypothetically. I would like to know what——

Senator STEWART. Well, you are talking hypothetically, too, so I reserve that right for myself. I mean, you haven't given me any hard facts that indicated—other than the fact that your seed prices went up—you can connect that with the patenting process, can you?

Ms. ANDERSON. I would like to see what there is. There is legislation that was passed 10 years ago, and we are proposing to amend it. I have yet to see any good evidence for its passage. I have a hard time with passing an amendment just because the other is there and we have to protect the rest of the plants. We are questioning what is happening to the seeds available to the home gardeners. If that is such a small market, and if the seed companies are being bought up by the large conglomerates, is it to their interest to put research money into what is a very small market to them? The point of the patenting is to encourage research. Now, if it is encouraging research only in producing corn that can be exported to other countries, what have we done? Have we provided for the 33 million households in America that are gardening, and that are going to continue to garden? There are all these facts flying around. The seed companies are being bought up—nobody questions that; the small ones are going out of business.

What's happening? And how do we ensure that we are going to keep having the varieties that might be suited to only a small area of the country?

Senator STEWART. How do you relate that, dear, to——

Ms. ANDERSON. Patenting?

Senator STEWART. Patenting, yes.

Ms. ANDERSON. Well, the intent of the patenting law in part was to stimulate research in the private sector, theoretically because the USDA wanted to get into more basic research. This is what was said. I have read the transcripts of the 1970 hearings; I have read almost everything I can find on this.

And that, apparently, is one of the reasons why——

Senator **Stewart**. Are you saying that the patenting process has not encouraged that kind of research?

Ms. **Anderson**. I can't tell. I can't tell from all the stuff that I have read what's going on. That's why we are here, and I think it's valid to ask for more information on that.

Senator **Stewart**. Oh, I don't think there is any question about that, I just wanted to know if you had some hard facts to substantiate your position.

Ms. **Anderson**. Let me give you an example of what we wanted to do in preparation for this hearing. We thought, OK, let's go and check out what varieties of certain crops were available before the 1970 patenting for home gardeners, and what has happened since then. Now, you try to find some old seed catalogs up in Burlington, Vt. You don't have them. We don't have access to the information; we don't know what research is underway now. There is a lot of factfinding that we are incapable of doing in our organization. And we haven't seen anyone else who has been able to do it either. We've tried.

Does that answer your question about what it is that we are here for?

Senator **Stewart**. Oh, yes, I understand what you are here for. If someone at the table has some hard information about how the patent law has affected adversely the groups you represent, please give it to me and I will be glad to listen to it.

Ms. **Anderson**. I think Cary Fowler had some in his testimony—he was listing some of the companies that hold the seed patents, for instance. We asked at one point for a list of home garden crops that had been patented, and we didn't get it. We thought maybe that would give us some clue.

Senator **Stewart**. I was going to ask you about the price of seed and the availability of varieties to farmers and gardeners. You apparently don't know about those two things. We will check it and see if we can find out. Those are good valid suggestions, and we will take a look at that, Katharine.

Ms. **Anderson**. There is one other point. There have been charges about how closely related the new varieties are, that some of the names and the way they are distinguished as new varieties don't necessarily indicate large differences in genetic makeup. I have studied the history of food crops enough, to be familiar with this trend.

And I think there are ways of scientifically looking at that to see whether in fact we are developing our new varieties from a narrower and narrower base, and if and how patenting affects this trend.

Senator **Stewart**. Well, I think there was some testimony here by Mr. Loden and others that there was a good bit of concern about the genetic base for soybeans, corn, and I think one pea crop—and then, of course, I am assuming that is a general concern on their part. You heard Dr. Lewis indicate to you that it wasn't the most glamorous thing in the world to be talking about, that they had presented very hopeful budgets. I don't detect—and maybe I am wrong about it—but I don't detect on the part of the people who have this responsibility in USDA a lack of concern about some of the same kinds of things that you are talking about. They just might have difficulty in the overall budgeting process and the overall scheme of things up here getting properly funded.

But I don't know that the kinds of problems that you are talking about relate directly to the patenting process. It may be well that you brought these things to our attention while we were talking about this legislation, but I frankly don't see the relationship, and I still would like to. If another member of the panel can give me that relationship—or, Jack, do you want to raise some other things?

Mr. Doyle. Well, Mr. Chairman, I would like to—there is no question that patenting will protect some researcher's development. Some of the concerns that we have relate to the corporate question, the two trends that have seemed to occur since 1970, since the enactment of the Plant Variety Protection Act, with the takeover of seed companies by large multinationals plus the pattern that appears to be emerging with the issuance of certificates by the plant variety protection office.

Senator Stewart. Now, what is the pattern that is emerging?

Mr. Doyle. Well, it was touched on briefly yesterday that there are two studies, one a Canadian study by Pat Mooney, which mentions that through March of 1979, he looked at all the plant variety protection certificates that were issued by USDA, and he also looked at firms that were acquiring seed houses, small seed companies. And he found that 46 percent of the patents issued by USDA's Plant Variety Protection Office were granted to the same 17 firms that were active in acquiring small seed companies.

Senator Stewart. Well, could it be that they have done the research and made an application for the certificates?

Mr. Doyle. I am not saying that the plant patenting act is the sole reason for the pattern and the trends that we are seeing with the large corporations coming in and taking over the seed companies and getting a number of the patents. But inasmuch as patenting provides a limited monopoly, a 17-year period of protection to the holder of that seed, then I think you have a market consideration there that didn't exist prior to 1970 and might be part of the explanation for why these corporations are making such acquisitions.

Senator Stewart. Well, you know, in the other areas of our economy, the cumbersome patent process, which is an awfully difficult thing to get yourself involved in, and an awfully expensive thing to get yourself involved in, is what prevents smaller concerns from protecting themselves and maintaining some kind of share in the market. It is my understanding, and maybe I am wrong about it—but we will check and see—but just the brief study that I have done on this particular statute, it's a much less cumbersome, much less expensive process which would answer that problem that exists in other areas.

And it does afford the protection for that limited period of time. So it would seem to be perhaps an incentive to encourage small-size concerns to take advantage of it and to spend the money that is necessary. Now, that may not be the case.

Did you want to say something?

STATEMENT OF DAN McCURRY, CONSUMERS FEDERATION OF AMERICA

Mr. McCURRY. On this question, yes, sir. I am Dan McCurry with Consumers Federation of America.

It is a fact that neither the Department of Agriculture nor any other Government agency can tell us the number of varieties on the market each year nor can they tell us the number of varieties that are in the pipeline, so to speak, going to market. Neither do we know, sir, the relationship between those numbers of varieties that are labeled [inaudible] and those varieties that either seek certification or receive certification in the typing process. We don't know that in this country. Therefore what we must do is to look at the impact of just that question, plant patenting, where it has been active, and the governmental reports—two examples: in Germany where no cereals on the market except those that are patented, cereal grains; and [inaudible] where, according to the testimony, 5 percent of the varieties offered for sale, only 5 percent, are not patented.

Now, what that seems to indicate, sir, is that the major seed companies primarily offer those seeds which they have control over to the patenting process, which would be a normal kind of thing you would expect. Now, how that relates in this country is that as seeds are bred for increased water usage, as seeds are bred for increased fertilizer consumption, and as those seeds become patented and become private domain, useful only to those companies that have those patents, that directly relates back to the kind of seeds a farmer has available to him for the planting and then the kinds of water he has to pump to pump those seeds. You know, we have a process now of moving pump water into corn; because of its genetic makeup, it absorbs it and it's dried out again. We have the same thing with several other of our grains. Fertilizers, with pesticides and herbicides, plants are now bred and patented, sir, to encourage the use of pesticides and herbicides not to discourage the use, and if the European example is——

Senator STEWART. Let me ask you something. What proof do you have of that?

Mr. McCURRY. When you look at the amount of pesticide and herbicide used—take the cotton case, for example.

Senator STEWART. All right.

Mr. McCURRY. Pesticide used on cotton—I don't have the USDA figures here—has increased incrementally over the past 10 years, and now cotton is the greatest on-farm user of pesticides because it has to have more pesticide to keep generating an equivalent volume of cotton.

Senator STEWART. Who produced the seed that caused that to be required?

Mr. McCURRY. Well, the same people that produce the cotton seed will produce the pesticide now to keep the weeds off that seed.

Senator STEWART. Well, I mean, what company did that?

Mr. McCURRY. I do not know here. Perhaps Dr. Lewis could tell us the major cotton producers; we only have aggregate figures from USDA.

Senator STEWART. What companies produce this cotton seed, major?

Dr. **LEWIS**. The largest cotton-producing firms are the Delta and Pineland Co., Scott, Miss.; the Stoneville Pedigreed Seed Co., Stoneville, Miss.; and Coker Pedigreed Seed Co., Hartsville, S.C.

Senator **STEWART**. Do those folks also engage in the production of pesticide and herbicide?

Dr. **LEWIS**. No, they do not.

Mr. **MCCURRY**. The Pineland Co. engages in pesticides. The Coker is owned by a foreign firm which also engages in pesticides and markets those in this country.

Dr. **LEWIS**. Coker did sell out to another firm.

Senator **STEWART**. But they were producing the seed and selling the seed.

Dr. **LEWIS**. I assure you, Mr. Chairman, they do not deliberately breed cotton to be susceptible to pests; that would be death if you did that deliberately to your crop.

Senator **STEWART**. The charge you are making seems to be a charge that we ought to look into. But what concerns me about your making the charge is that I just got through talking to a fellow that is involved in an experiment station, creating a new variety, breeding a new variety, for release that will—it's a new type vetch, I think, that will grow in certain areas of the country, certain areas of the world, where it would not grow prior to this time. And they worked on it for some 15 years. And they bred the vetch, the new vetch, because farmers could not raise that in certain parts of the world. And so they met the problem.

He also talked to me about a fellow who had a monopoly on I think it was tabasco sauce, if I am not mistaken—the pepper, grew it on an island off the coast of Louisiana, I think. And the university in my home State worked for I think 10 years to produce a new variety that could be raised other than on that island. Now people raise the tabasco pepper, I guess it is, that is used in the pickling process and a lot of other processes in many, many parts of the world. This fellow had a pretty good operation prior to that time because they offered him some $300 million—a client of a good friend of mine down in Montgomery offered him some $300 million for his whole operation—and he wouldn't take it. Now, that was prior to the time they created this new variety.

So I don't know that your charge, you know, people creating new varieties, breeding new types of plants so that pesticides and herbicides would be purchased in order to raise that crop is correct. Yesterday they indicated you take the good with the good and do it in a rapid fashion like they did in soybeans, it may be that you get greater yields. But in addition to that you also get a plant that has certain genetic characteristics that cause it to require greater herbicides and pesticides. You may balance off one against the other.

Mr. **DOYLE**. Senator, I believe that very point you make was a finding in fact in the OTA study. There was a recently completed OTA study.

The Office of Technology Assessment found that although since 1970 there have been varieties developed with higher yield, that the resistance to pestilence and blights overall has been less.

Senator **STEWART**. Of course, the same people you are talking about doing all of these bad things have recommended that $10 million be spent by the Department of Agriculture to broaden the genetic base to protect us from that. You know, I see in that an indication that there is a strong sense of doing what you want done, of providing some protection.

STATEMENT OF GINGER NELSON, NATIONAL CENTER FOR APPROPRIATE TECHNOLOGY

Ms. **Nelson**. Senator, my name is Ginger Nelson, National Center for Appropriate Technology. And I do believe that the Department of Agriculture is very concerned. I think that one of the things that most all of us here would like to see is that some sort of a study be done to look at what this act—it was passed in 1970—has caused as far as changes in the industry.

There has been a great deal of change within the industry since 1970. Most of the companies that are being brought up, as far as small seed companies are the ones that are doing plant breeding. The small seed companies that are——

Senator **Stewart**. They do innovative work?

Ms. **Nelson**. Yes, they are doing the breeding.

Senator **Stewart**. That parallels what is happening in the energy area, it parallels what is happening in your high technology-type industries, it parallels things across the board. And I don't know that you can link that back to the patenting process that was established by the Agriculture Department with regard to the protection of plants. In fact, as I said earlier, what we are trying to do in other areas of the economy is to modify the patenting process in such a way that it is available to the small business entity to change that—that is just one of the things that we are trying to do. We are talking about tax structure, we are talking about Government policy in the area of research, grants for research, we are talking about regulatory activities on the part of agencies and making it more flexible. And then, of course, we are talking about the patenting process, increasing or enhancing the capabilities of the small-size concerns to raise equity capital. Those are the kinds of things, and in that list of things a very important thing is modification of the patenting process to put it in the same shape that it is in in the Department of Agriculture.

So you all may have a point that there is a concentration in the seed production in this country, that the small companies that are innovative are being bought by the large-size fellow. And to say that they are bought by the folks who produce the pesticides, if you want to look around and see what else they produce—they've got so much money that they are going to be producing everything after a while; you know, they may buy the whole economy.

Mr. **McCurry**. Senator, I think one of the questions is how much money that the seed industry—and we were looking at those figures yesterday, the seed price increases. In a preliminary study I did of some of the annual reports of the seed industry over the past 5 years, they are in many cases cash-rich. And that is why they are becoming equally attracted partners for——

Senator **Stewart**. What I am saying to you, though, is that you also take a look at the tremendous increases in price of energy that is produced, that is the biggest increase in other areas, and that means that there is a heck of a lot of cash there, and they are not only buying that, they are buying retail chain stores, they are buying electrical implement manufacturing companies—I mean, there is all kinds of things that are happening. Let's just say we repeal the patenting process outright, you would be back up here next year talking to me about your concerns about concentration in a number of agricultural areas, and the fact that you didn't have enough seed varieties, because I don't think this would stop it, I don't think this would stop it. In fact, you may be taking away a protective device that put with other mechanisms would provide the answer to the problems that you are raising.

Mr. McCURRY. Could I raise some questions, particularly legislation, because I know that this has to be decided on. I've got three problems with this.

Senator STEWART. What has to be decided on?

Mr. McCURRY. At some point this committee has to decide on this particular legislation before it.

Senator STEWART. Who told you that?

Mr. McCURRY. I thought that was the nature of the legislative process.

Senator STEWART. Yes, but I don't know who told you that. I'm the only one sitting here that has a vote.

Mr. McCURRY. Well, I'd like to talk to you about some problems I've got with this legislation, Senator.

The first one is in the budgetary process itself. Ten years ago, when the legislation was introduced, the seed industry was willing to adopt the same kind of fee schedule the Department of Commerce had for its patents, namely, that this office was supposed to be sufficient up to 60 percent of its budget. Right now the best that I can figure from fee in the office is about 15 percent sufficient to its budget. In the figures you got yesterday, there was a sizable portion of very large seed companies that were seeking patents. It seems to me that in a time of tight budget it might be appropriate to consider a sliding scale for applicants so that small companies, small farmers, pay less and larger firms pay much more, which——

Senator STEWART. I don't know whether you can do that constitutionally, you might—you can set certain categories for taxing; I assume you can for this. But probably there would be some question about it.

Mr. McCURRY. So that this office, if it was doing a good job, will have much more adequate fees—and the industry said 10 years ago it was willing to do that. And that is how patents are devised in Commerce—there's a 60-40 split. Why not here as well?

The second question that I have with this legislation is in sections 4, 8, and 9, sir, when the action is requested to change the word from "specifications" to "descriptions." One concern that Consumers Federation has had about this legislation all along is that once you start asking general questions, namely, about descriptions of these plants that are coming up for patents, you lose the ability to ask, for example—two kinds of questions which I deal with in my testimony. Seeds as they interbreed over a period of time have been a concern of the Food and Drug Administration, that certain kinds of poisons, certain kinds of toxins, if you will, get sort of bred in. Right now we don't know, as plants are offered for patenting, what potential there is for those toxins to be available in plants that are on the market in this country. The Food and Drug Administration asked for the ability to test those things out a few years ago; the seed industry raised a number of objections, and then it got put on the back burner.

If we change this wording from "characteristics" [sic], which would give us the opportunity to ask that question, to "descriptions," we lose that opportunity.

Second, and another question, research at the University of Illinois has raised some questions about the ways the genetic makeup of a plant is changed because of the application of herbicides and pesticides. Those change what goes on genetically, and those genes carry on from generation to generation. If we change from the word "characteristics," which allows—"specifications"—which allows us to ask very specific questions, to the word "descriptions," we lose the ability to ask those questions.

Now, right now the Plant Variety Protection Act does not require those kinds of questions to be asked. If we change the law to the word "descriptions," that whole question is put aside.

Finally, sir, on this legislation, it seems to me that the impact statement that the Department of Agriculture sent over here was so insufficient in terms of the questions this committee has been able to raise that it would be most appropriate for you to ask the Department of Agriculture to prepare a more complete impact statement, which they should be able to do question by question, before this committee could deal with this legislation again.

Senator **Stewart**. Well, I thank you all for your testimony, and there is a possibility that I will want to ask you some further questions at a later time, after I have had the opportunity to review more fully your testimony. There is also the strong possibility that I will have some information for you in response to some of the questions that you asked, because I think some of them are legitimate questions to ask.

And I assume you all are here in Washington, is that correct? You are not.

Ms. **Anderson**. Vermont.

Senator **Stewart**. I'll get Pat Leahy to tell me where you are, and I will get that information.

Ginger, are you from here in Washington?

Ms. **Nelson**. I'm from Washington, yes.

Senator **Stewart**. OK, we may want to discuss further with you what you had to say here.

Mr. **Doyle**. Senator, one point you touched on.

Senator **Stewart**. All right.

Mr. **Doyle**. I think most of us here are concerned about the small business seed person as well as the small business seed firm, and if the Congress is in a position, in a policymaking position now, on this patenting issue with regard to the six vegetables, or possibly the coverage extended throughout the whole act, that we could look—that Congress could consider certain ways whereby the patenting system, extended to the seed industry, wouldn't perhaps give the preferred monopoly and market guarantees to the larger firms, that perhaps through tax structure the smaller firms could be given incentives which were linked to nutritive value, energy, and environmental considerations.

Senator **Stewart**. We are working on that broader question. As a matter of fact, I've got a hearing now in Small Business where we are working on the broader question. But we also would want to tackle it in areas like this. You can rest assured that the thing that concerns me the most in this particular area is the fact that there is a concentration in the industry. I don't think that does much for the competitive situation. I don't think that does much for innovation, because those companies tend to be less innovative than your smaller companies do. As a result, the ultimate consumer is not helped by that.

Now, I don't know that the patenting process necessarily brought that about, but we will take a look at that and see.

Mr. **Doyle**. Well, for one example, nutritive value, nutrition, is not considered in the granting of patents now under the Plant Variety Protection Act—and if you are to make tax incentives more structurally weighted toward the small businessman for coming up with a nutritionally valuable variety or genetically stronger variety, that kind of tax incentive.

Senator **Stewart**. Thank you all for coming, the subcommittee is adjourned.

[Whereupon, at 9:40 a.m. the subcommittee adjourned, subject to call of the Chair.]

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APPENDIX

Statement of Barbara Lindemann Schlei, Administrator, Agricultural Marketing Service, U.S. Department of Agriculture

Mr. Chairman and Members of the Committee, we appreciate this opportunity to appear before your Committee to present the Department's views on S. 2820, a bill to amend the Plant Variety Protection Act (PVPA). Accompanying me today is Bernard Leese, Commissioner of the Plant Variety Protection Office.

The Department recommends that this legislation be passed. However, before I get into a discussion of the proposed amendments, I would first like to provide the Committee with some background on the PVPA, which was enacted almost a decade ago, and discuss some of the statements made during the course of House hearings, and in succeeding months, on the legislation.

The Plant Variety Protection Act, enacted into law December 24, 1970, provides patent-like protection to breeders who develop or discover distinctly new plant varieties which are reproduced by seeds. The Plant Variety Protection Office grants certificates of protection to breeders on the basis of novelty, stability and uniformity within the variety. The "certificate of protection" gives breeders exclusive rights (for 17 years) to prevent unauthorized sales of protected seeds in channels of commerce. These are private property rights and are limited to each variety for which a certificate of protection has been issued by USDA.

Participation in PVPA is voluntary. In order to participate, a breeder must apply for protection. Enforcement of the PVPA is also the breeder's responsibility through civil law. The government has no responsibility for enforcement of the program.

At the time a request for a certificate of protection is submitted to the Department, the breeder submits a description of the variety and documents to demonstrate the variety is distinct and meets the requirements of the Act. The breeder also submits 2,500 viable seeds. The seeds serve as an authentic voucher sample and are permanently preserved in the National Seed Storage Laboratory (gene bank) at Fort Collins, Colorado. A limited number of these seeds, as well as any other germplasm deposits in the Fort Colling facility, are available to the public at any time for use in developing new varieties and for purposes of conducting research on protected varieties.

During the last two decades, private plant breeding has been on the rise and is now a major source of new varieties, augmenting varieties developed by public institutions. The reason for this is one of economics—the private breeder for the last decade has had the opportunity, via the PVPA, to recover his ventured capital and make a reasonable profit. A breeder may often spend many years in developing a new variety and fail. If those labors, however, result in a new variety, there are still the costs of marketing it—advertising and distribution costs, production costs, and all of the other costs associated with operating a business. The legal protection of property ownership afforded by PVPA is intended to provide an incentive to the development of new varieties.

Plant protection certificates currently have a 17-year limit. Once that period of time expires, the variety enters the public domain and is then available to anyone for merchandising. If, however, it is determined that anytime during the 17-year period of protection that the variety is needed by the public, the Department has the authority to declare it open to use and, thus, make it available to the public. Also, research to develop improved varieties during the 17 years does not constitute infringement. To date, the Department has never had to exercise this authority.

Under the present PVPA almost all sexually reproduced plant varieties are eligible for protection. Since inception of the Act in 1970, the Plant Variety Protection Office has received a total of 1,140 applications for 70 distinct crops and has issued 702 certificates of protection. A total of 89 applications have been received from foreign countries, 131 from experiment stations, and 920 from private breeders in the U.S. of these 1,140 applications, 278, or 24.4 percent, were received from the seven largest U.S. companies; namely, Asgrow, Burpee, Dekalb, Ferry-Morse, Keystone, Northrup King, and Pioneer.

Since enactment of the PVPA there has been a further increase in the number of breeders developing new varieties, as well as an increase in the number of varieties developed. For example, during the period between 1953 and 1970 before PVPA went into effect, there were a total of 50 certified wheat varieties released by public agencies. Since PVPA went into effect, a total of 54 certified wheat varieties were released during the 1971–1978 period alone; 23 of which received a certificate of protection under the PVPA.

The Department's Plant Variety Protection Office has developed a computer system for identifying plant characters. Published descriptions of previously released varieties from all parts of the world were transferred to the computer for storage, quick retrieval and comparison. When applications on new varieties are filed, they must be described by the same standard form and are compared to existing varieties to assure uniqueness. Once the background information for each crop is stored in the computer, the search for novelty of a particular variety becomes a relatively simple task. To date, we have in excess of 15,000 plant variety descriptions covering 70 crop species stored in the computer. This computerized system is attracting world-wide attention because it is (1) less costly, (2) more rapid, (3) more objective, and (4) will preserve variety descriptions in a standard format for posterity. Australia, Canada, Japan, and New Zealand plan to duplicate our system. Argentina, Brazil and other South American countries are interested as well. Not only do we have a complete description of the genetic resources contained in these new varieties, but also the seeds of these varieties are stored and maintained in our National Seed Storage Laboratory at Fort Collins, Colorado.

During the course of hearings by the House Agriculture Subcommitttee on Department Investigations, Oversight, and Research, several opposing viewpoints concerning the effect of the new provisions were expressed. Opponents to the PVPA amendments said, in effect, that (1) the PVPA amendments could restrict use of plant varieties and result in vegetable varieties being declared illegal as has happened in Europe, (2) the PVPA amendments could lead to the loss of non-protected varieties and their genetic heritage that has evolved over thousands of years and thus resulting in increased genetic uniformity, and (3) the amendments would increase seed company mergers benefiting large corporations.

It is only appropriate that we address each of these concerns so that an accurate and complete record can be made.

PVPA does not restrict the use of plant varieties. The PVPA has no regulatory function, or does it legally restrict farmers or gardeners from growing certain varieties of crops. The Act merely gives breeders exclusive rights for 17 years to market their new varieties and to prevent the unauthorized sale of their protected varieties. The concern of opponents that use of certain varieties of vegetables will be made illegal may arise from observations of the European method of merchandising varieties associated with the European breeders' rights program. In Europe, it is possible for a new variety to be protected under the European breeders' rights laws and not be placed on any of the Common Market national lists, and vice versa.

In Europe, there is a system which restricts the sale of some plant varieties. Each Common Market country publishes a list indicating which vegetable varieties can be sold. To be on the list, a variety must meet certain performance requirements. The purpose of the list is to protect the consumer against obtaining varieties which are: (1) not adaptable to growing conditions in the country, (2) found to be inferior to similar varieties, or (3) sold under more than one name for the same variety and thus misleading to the consumer.

Restrictions similar to the European national list system are not only prohibited by the PVPA but also are impractical in the United States, due to vast differences in climate and soil types throughout this country. A national list based on performance of the variety would also be counter to our national philosophy, which considers consumers the best judge of their own seed needs.

PVPA does not compel a reduction in market varieties, or encourage genetic uniformity. There has been no conclusive study showing a relationship between plant variety protection, genetic uniformity, and the reduction of germplasm. However, the Act is intended to encourage the development of new varieties which may better suit consumers' needs. New varieties are usually developed to meet specific needs of users (such as resistance to a particular disease), but no one forces these new varieties on the public.

With the introduction of new varieties, demand may or may not decline for older varieties. But the old varieties need not be lost. The genetic material is preserved in public seed banks and is available to public and private breeders for development of new and perhaps even better varieties. Therefore, germplasm from older varieties may be contained in the makeup of newer varieties. Based on a review of certified wheat, about three-quarters of the varieties sold in 1961 are in commercial channels today. In addition, there are 66 percent more varieties of wheat marketed today than in 1970.

The most important issue raised by opponents of the Plant Variety Protection Act and its proposed amendments is genetic uniformity. They contend fewer varieties are being used for commercial production, thus restricting the range of genetic diversity of a particular crop in its entirety and causing it to be more widely vulnerable to devastating attacks by pests. For this reason, it is important to encourage the development of more new varieties so that total genetic diversity among commercially available varieties will be expanded. The PVPA is intended to accomplish this objective by requiring a distinctive or objective character that will distinguish a protected variety from all other varieties.

PVPA has not been shown to encourage uniformity in crops. To receive a certificate of protection, PVPA requires the variety to be distinct from all other varieties. The difference must be objectively described. Each new variety adds to the diversity of material available to growers. The Act requires uniformity within a variety and not uniformity among varieties. PVPA recognizes the need for genetic diversity and does not restrict the genetic material of a protected variety. The germplasm contained in protected varieties is available to anyone for use in breeding a new variety. In addition, world and national collections of germplasm are available to researchers for the asking.

PVPA does not compel seed company mergers. The Plant Variety Protection Act has fostered the creation of several one and two person companies. Before, PVPA, approximately three companies were breeding soybean varieties. Today there are more than 25 companies developing new soybean varieties. Large companies have a merchandising advantage which enables them to recoup ventured capital used in research. Small companies who do not have this advantage could benefit more from protection by the Act.

It is an enormous task to develop a new plant variety with a higher yield or a resistance to a specific disease. In some cases, thousands of crosses must be made, documented and tested and one may or may not develop a useful new variety after years of work. If American agriculture is to remain as productive as it has been, it must continue to make technological advances. In plant breeding, PVPA is designed to encourage the private sector to help the public sector develop new and competitive plant varieties. It is a tool used by private breeders to protect their efforts and investments when they succeed.

Mr. Chairman, we believe it is clear that these opposing viewpoints are directed more at the overall concepts of legal rights for breeders of plant varieties than the legislation which is pending before the Congress. Patents have served this country well for over 200 years. Major efforts to improve the patent system have been recommended by the Administration, as well as numerous other bills proposed by the Congress.

I will now turn briefly to a discussion of the PVPA amendments pending before your Committee.

Based on experience since implementation of the Act after its passage in 1970, we believe there is a need to amend the Act to refine and update its provisions.

The legislation, which is primarily technical in nature, would refine and update certain terminology in the Act. It would also extend from 17 to 18 years the period of time during which developers of novel varieties of sexually reproduced plants have exclusive rights to sell, reproduce, import or export such varieties, or use them in the production of hybrids or different varieties. This proposed 1-year extension of the grant of plant variety protection, while not needed for membership in the International Union for the Protection of New Varieties of Plants (UPOV), would better comply with the spirit of the protection provided by the Union's member states should the United States become a member. The legislation would also allow publication of the name of an applicant for plant variety protection and whether the applicant specified that the variety is to be sold by variety name only as a class of certified seed. The failure to allow automatic publication of (1) the name of the applicant and (2) whether the variety is to be sold by variety name only as a class of certified seed has required the Plant Variety Protection Office to request express permission from each applicant for such publication. Permission is not always received. This creates confusion for farmers and seed certification agencies because of labeling requirements, certification requirements, applicability of the grower's exemption and the question of private suits for infringement versus violation of Title V of the Federal Seed Act. The bill would permit, but not require, more specific labeling for the information of the purchaser, and would repeal section 144 of the Act which exempts six canning vegetables—namely, okra, celery, peppers, tomatoes, carrots, and cucumbers—from coverage under the Act. We support repeal of section 144 since we feel that breeders of the six currently exempted crops who may wish to develop them for sale should be permitted, if they so desire, the same protection as in the case of all other crops protected under the Act.

At the time PVPA was before Congress in 1970, two canning companies objected to the law based on the fear that the legislation would increase the cost of raw vegetables and therefore increase the cost of their products. As a compromise, six vegetables that were important to these canning companies were excluded from the Act. Since then, the canning companies have found that the Plant Variety Protection Act has not affected the cost of raw produce. Consequently, these companies do not now object to the repeal of section 144 of the Act in order to allow the six vegetables the same protection as all other seed reproduced crops.

Section 42(a)(2) of the PVPA presently establishes a bar to the granting of plant variety protection if an application for protection of the particular variety has been filed on behalf of the same breeder in a foreign country more than one year before the effective filing date of the application in this country. This fails to take into consideration where an application was never processed to the stage of protection being granted. Such situation, although it has never been applied in practice, is inconsistent with the policy of the PVPA as set forth in its preamble and with the International Union for the Protection of New Varieties of Plants (UPOV) Convention.

The suggested amendment to the PVPA would prevent the granting of protection to a breeder whose variety has been marketed abroad for more than 4 years (or 6 years in the event of woody plants) prior to filing an application for protection in this country. The amendment would eliminate the unintended bar to protection and bring the section into conformity with Article 6 of the UPOV Convention.

The proposed amendment to Section 501 of the Federal Seed Act would make it unlawful to sell or offer for sale or advertise by variety name seed which has not been certified by an official seed certifying agency when it is a variety for which a certificate of protection has been issued under the PVPA. Section 501 of the Federal Seed Act presently applied only to the "sale" of seed when the certificate of plant variety protection specified sale by variety name only as a class of certified seed. By their very nature and purpose, solicitation of sales (offering for sale and advertising), by variety name, promote sales which are presently illegal. The proposed amendment, in prohibiting such solicitations, would substantially strengthen the protection of holders of certificates of plant variety protection.

The amendment to Section 501 of the Federal Seed Act is consistent with legislation transmitted to Congress June 29, 1979.

The Department urges favorable consideration of the PVPA amendments. It views the total PVPA as having rather limited effects on the genetic vulnerability and on the degree of economic concentration in the seed industry. This is in part because of the dominance of hybrids, which do not need patent-like protection, in some of our most important crops. The impacts of PVPA on the structure of the seed industry are probably mixed. It would seem to make the business a bit more attractive for very large firms and at the same time to increase the economic viability of some rather small seed breeding firms. Both the issues of genetic vulnerability and potential monopoly power in the seed industry and its implications for genetic vulnerability require examination in a broader context than PVPA. The impacts of PVPA on these matters appear to be limited and more likely to be favorable than otherwise.

The Department of Agriculture plans an active role in reviewing the concerns about the loss of germplasm and inadequate genetic diversity and advising the Congress and the public on programs and policies to deal with them. The basic concerns about genetic vulnerability do merit further review including assessment of the effectiveness of the SEA plant genetic resources programs.

Mr. Chairman, this concludes my statement. We will be glad to respond to any questions you may have.

STATEMENT OF DR. QUENTIN JONES, SCIENCE AND EDUCATION ADMINISTRATION, U.S. DEPARTMENT OF AGRICULTURE

THE NATIONAL PLANT GERMPLASM SYSTEM

The National Plant Germplasm System has responsibility for the acquisition, identification, documentation, maintenance, evaluation, and distribution to user scientists, of the crop genetic stocks needed for the development of improved crop varieties. This national system involves the U.S. Department of Agriculture, the State Agricultural Experiment Stations and the private sector.

Because of the critical importance of plant germplasm to United States agriculture and to the Nation, the Director, Science and Education Administration, USDA, commissioned a study of the entire National Plant Germplasm System to assess its strengths and weaknesses and to determine how the latter can best be corrected. The study report, which will be completed in late August, 1980, will deal with the management, manpower, and funding needs of the System and its constituent units.

STATEMENT OF HAROLD D. LODEN, EXECUTIVE VICE PRESIDENT, AMERICAN SEED TRADE ASSOCIATION AND EXECUTIVE VICE PRESIDENT, NATIONAL COUNCIL OF COMMERCIAL PLANT BREEDERS

My name is Harold D. Loden. I am the executive vice president of the American Seed Trade Association and also executive vice president of the National Council of Commercial Plant Breeders.

The American Seed Trade Association represents nearly 700 seed companies, 65 state and regional associations and we believe the entire U.S. seed industry. The membership on the National Council of Commercial Plant Breeders is composed of 36 firms who maintain proprietary breeding programs and represent a major part of the private plant breeding conducted in the United States.

The U.S. seed industry and the organizations which I represent strongly support S. 2820 and the principle of plant variety protection because of the benefits the Plant Variety Protection Act, (Public Law 91-577) will continue to bestow on American agriculture, and of most importance, upon the consumers of the products of our agricultural economy. The Plant Variety Protection Act has fulfilled the expectations of the developers of this legislation. It has created the economic environment necessary for the development of new non-hybrid sexually reproduced crop varieties. It has increased the investment of private resources in varietal development. It has increased the number of firms engaged in proprietary variety research and has resulted in the investment of additional resources by those firms who were conducting variety development programs prior to the enactment of the law in 1970. Prior to enactment of the Plant Variety Protection Act a major portion of all private funds invested in variety development was expended in the development of hybrid varieties which have biological protection, and for which legal protection is not required. Today, as a direct result of the Plant Variety Protection Act variety development programs covering a large number of non-hybrid crops have been initiated.

S. 2820 contains a number of housekeeping provisions which would eliminate needless requirements and bring the Act into line with actual practice in the office. Four other amendments of significance are:

1. Deletion of Section 144—This amendment would correct the inequity in the existing law which currently denies the breeders of six kinds of vegetables, tomatoes, okra, celery, peppers, cucumbers and carrots, the same rights as are accorded the breeders of all other sexually reproduced crop varieties.

2. Extension of Period of Protection—The legislation would extend the period of protection from 17 to 18 years. This proposal would be in accord with the treaty of the International Union for the Protection of New Varieties of Plants (UPOV). It is important to realize that this difference between the U.S. Plant Variety Protection Act and the International Convention relates only to the protection of seed reproduced vines, fruit trees, rootstocks, forest trees and ornamental trees of which rootstocks probably represent the only class of plants to which this amendment is likely to apply since few, if any, of the kinds of plants to which the 18 year period of protection is extended are sexually reproduced and therefore eligible for protection under the U.S. Plant Variety Protection Act. The International Convention requires a period of 15 years for all other kinds of varieties. This amendment remedies a technical difference between the U.S. law and the International Treaty which even though of minor practical importance, would make the U.S. Plant Variety Protection Act comparable with the International Union for the Protection of New Varieties of Plants should the United States decide to ratify the treaty and become a member of UPOV at some future date.

3. Amendment to Section 42(a)(2)—This section establishes a bar to the protection of varieties developed by a breeder in a foreign country if the breeder does not file an application for protection in the U.S. within 12 months of the application in the foreign country. It is difficult for foreign breeders to comply with this provision since they do not want to make an application for protection in the U.S. until they know the outcome of the tests, lasting as long as 4 to 6 years, before protection is granted in the foreign country which most often will be the primary market for the variety. The net result is that after the tests are completed in the foreign country they cannot then apply for protection in the U.S. since the application for protection in the U.S. was not made within one year of the effective date of the application in the foreign country. Since the U.S. protection cannot be obtained, foreign breeders

may choose not to sell their variety in this country. This means that U.S. seedmen and consumers are denied access to such varieties. This provision of the U.S. Plant Variety Protection Act is not consistent with the International Treaty (UPOV). The proposed amendment to Section 42(a)(2) of the Plant Variety Protection Act would eliminate this unintended bar to protection of a foreign variety, make such varieties available to the U.S. consumer and would bring this section of the Act into conformity with the UPOV Convention.

4. Amendment to Section 501 of the Federal Seed Act—Section 501 of the Federal Seed Act prohibits the sale of uncertified seed of varieties protected through the certification option of the Plant Variety Protection Act. The proposed amendment would also make it unlawful to "offer for sale or advertise" by variety name seed which is not certified when the owner of the certificate of protection has elected that the variety be sold by variety name only as a class of certified seed. The proposed amendment would prohibit the solicitation of sales, by offering for sale or advertise, which, if consummated, would be illegal. This amendment would permit the orderly marketing of protected varieties for which the owner has elected the certification option.

This amendment is needed for effective administration of the Federal Seed Act and the seed industry supports its adoption concurrent with amendments to the Plant Variety Protection Act.

During the hearings by the House Agriculture Subcommittee on Department Investigation, Oversight, and Research, opponents of this legislation presented a number of opposing viewpoints. Seed industry response to these allegations are:

1. Plant Variety Protection will increase genetic vulnerability. Actually, the situation is exactly the reverse. When the Irish Potato Famine occurred in 1845–1847 nearly all farmers were planting the same variety. The effect of the disease which attacked the potato crop caused famine and even major migration. The fundamental reason for the catastrophe was that there was not a research oriented agricultural industry to make available disease resistant varieties. Had the corn blight which hit the U.S. corn crop in 1970–71 done so in the absence of a strong, agricultural research base, results could have been equally, or even more, catastrophic. However, within one season the hybrid seed corn industry was able to completely change the genetic makeup of the crop and provide U.S. farmers with disease resistant varieties. The fundamental reason this could be done is that the U.S. seed corn industry operates in an environment of biological protection, characteristic of hybrid crops, and can therefore afford to make the necessary investments in research to respond quickly and positively to the threat caused by the corn blight. Seed companies, like any other business need economic incentives to make investments in research. Continued research leads to even better varieties, with higher yield, disease resistance, and quality. The U.S. Plant Variety Protection Act provides the economic environment within which to make this investment for non-hybrid crops. Plant variety protection provides the incentive to maintain broadly based genetic pools from which new varieties may be developed—this is exactly the opposite hypothesis to that of the opponents of plant variety protection.

The loss of genetic materials is an entirely different problem unrelated to the development of new varieties or a farmer choosing which variety will or will not be grown. The Plant Variety Protection Act has not relationship to the protection of genetic materials in the wild, this is a function of those scientists involved in the collection and preservation of plant genetic resources from which cultivated varieties are developed. The potential loss of genetic materials has been a major concern of the USDA since its formation and the Department has well established programs for collection, preservation and utilization of plant genetic resources. True, this program is not financed at the level at which many of us would like but this is due to budgetary restrictions and Congressional decisions which are in no way related to plant variety protection or to the amendments in S. 2820.

We would welcome the opportunity to appear before this and other Committees requesting a strengthening of the current plant genetics resources programs of the USDA.

2. The "European Experience." Opponents have made numerous references to the "European Experience" and the threat of varieties being declared "illegal" with even the possibility of being fined for growing an illegal variety. There is no basis of fact for this allegation. The erroneous assumptions result with uninformed persons confusing, and combining, two entirely different systems, characteristic of many European countries, one for the protection of variety rights and the other a catalog or list of approved varieties. Under European Community law, seed of the more important agricultural and vegetable crop varieties may only be marketed within the Community if the variety concerned has been found to be distinct, uniform and stable and has accordingly been entered on a National List of a Member State. In

the case of varieties of agricultural crop species, a variety is subject to an additional examination to establish that it is of satisfactory value for cultivation or use. This legislation is designed to protect the European consumer through the elimination of synonyms and by ensuring that seed which is marketed is capable of reproducing itself true to variety. It has nothing whatsoever to do with plant breeders' rights. The U.S. does not have a system of approved variety lists, none are contemplated, and furthermore would not be tolerated by the American farmer. The Plant Variety Protection Act is in no manner related to the establishment of a system of approved varieties in the U.S.

Opponents of the legislation have stated it is not only illegal in the U.K. to market seed of an unlisted variety but also to grow it and to do so the producer is subject to heavy fines. The following is a quotation from Mr. P. W. Murphy, Controller of the United Kingdom Plant Variety Rights Office in a statement submitted to the House Agriculture Subcommittee on Department Investigations, Oversight and Research:

"This is untrue. We do have an area in Essex which is a protected area for the purposes of seed production. In this area, growers of commercial crops of beet, brassicas and onions can be required to 'top-off' their bolting plants before flowering to prevent cross-pollination with registered seed-producing crops. Failure to do so can result in a fine of up to 20 pounds for a first offense. This has nothing to do with plant patents, Common Catalogue or the like. Outside this area of Essex there are no restrictions whatsoever on the growing of the normal range of crop varieties."

The Plant Variety Protection Act does not restrict the use of plant varieties. The Act has not regulatory function. The decision whether or not to protect a variety is voluntary. Protected and unprotected varieties will always be freely available in the market. The decision of whether or not to purchase and plant a protected or unprotected variety is one made by the consumer. No variety which has been marketed for one year may be protected and continued availability of seed of any variety will be determined by the consumer in the market place.

3. Plant Variety Protection will increase seed company mergers and concentrate the seed business in a small number of multinational corporations. Much has been said about the increased involvement of multinational corporations in the seed business. This is true. It has been charged that this has been due to the Plant Variety Protection Act. This is not true. This take-over phenomenon is not unique to the seed industry. It is a feature of our financial situation, particularly the structure of U.S. inheritance tax laws and the declining value of the American dollar when compared to other currencies. The basic decision in a merger or acquisition is related to profitability and long range growth potential of the business. Seed companies are research based and if they have been successful in their research they have been profitable, have growth potential and are attractive prospects for mergers or acquisitions. Another established fact is that a majority of the companies involved in merger and acquisitions are those whose base has been primarily in production of hybrid crops, and not a result of the Plant Variety Protection Act, since the Act does not protect hybrids.

There has been an increase in the total number of seed companies conducting proprietary variety research in the U.S. since enactment of the Plant Variety Protection Act of 1970. The Act fosters creation of small companies since it provides the economic environment which creates the opportunity to recover capital invested in research and protect those products developed. In this economic environment, small companies are able to compete with larger firms.

4. Variety protection will cause prices of seeds to rise. The answer to this criticism is very simple: The American consumer has always demonstrated his willingness to pay more for a better product and his refusal to even purchase an inferior one. In the case of seed, what the consumer buys is results, and the variety must deliver. No one can afford to put an inferior variety on the market. If he does it will not succeed—competition won't allow it.

5. U.S. involvement with UPOV. The International Union for the Protection of New Varieties of Plants (UPOV) and possible U.S. membership in UPOV has been a target of the opponents of this legislation. The basis for UPOV is the International Treaty for plant variety protection. This treaty was revised in 1978 at which time it was signed by the U.S. The U.S. can ratify the treaty and become a member of UPOV without in any manner affecting the administration of the existing Plant Patent Act or the Plant Variety Protection Act.

Fundamental features of the UPOV treaty:

a. It obligates each member to provide an adequate system of national plant variety rights.

b. It requires that a protected variety be new, distinct, uniform, and stable.

c. It protects the breeder of a new variety from piracy.

Of equal importance, UPOV does not:

a. Require any member state to adopt the laws and practices of other states.

b. Expect or demand national catalog systems for varieties.

c. Have any effect whatsoever on trade in old or traditional varieties. Anyone is absolutely free to plant, grow, harvest, or sell seed of these old varieties without paying royalty or even having the permission of the breeder.

d. Restrict in any manner the ability of plant breeders to use protected varieties for research and breeding of new varieties.

6. Plant variety protection encourages genetic uniformity of crops. Genetic uniformity in crops is not the result of plant variety protection but is due to agricultural progress. Farmers and gardeners chose one variety over another because of yield or quality factors. Human nature is such that everyone wants to plant the best and most profitable variety. Advances in variety development to improve yield and quality have led to an increase in genetic uniformity—or a decrease in genetic diversity. Should development of new and improved varieties be halted? Should the wheels of agricultural progress be stopped? Should producers not capitalize on the benefits of the best new varieties in order to provide the diversity of germplasm which may or may not have genetic resistance to an unknown pest or disease organism? The obvious answer to all of these questions is "No" which emphasizes the necessity to encourage the development of more new varieties so that variability among commercially acceptable varieties will be increased. The advances made by plant breeders, operating in the economic environment created by plant variety protection, is the best solution to the problem of genetic uniformity.

Mr. Chairman, it is evident that the primary opposition to S. 2820 which would amend the U.S. Plant Variety Protection Act does not deal directly with the amendments but is directed more specifically to an attack on long standing principles in the American system of free enterprise. The Plant Variety Protection Act is based upon the principle that if a person invests his assets in development of a new variety, and is successful in developing one which meets consumer demands and can withstand the competition in the market place, he should expect to be rewarded. Our system not only provides the basis for rewarding those who succeed but also provides the opportunity to fail. The principles upon which the U.S. Plant Variety Protection Act are based are "as American as ice cream and apple pie". We urge you to approve this legislation so that the benefits inherent in the PVP Act may be extended to breeders of new varieties of sexually reproduced crops with benefits available to American farmers and gardeners and, of major importance, to the consumers of the products of American agriculture.

[The following letters were subsequently submitted by Mr. Loden.]

American Seed Trade Association, Inc.
Washington, D.C., July 31, 1980.

Hon. Donald W. Stewart,
Chairman, Subcommittee on Agricultural Research and General Legislation, Senate Committee on Agriculture, Nutrition, and Forestry, Russell Senate Office Building, U.S. Senate, Washington, D.C.

Dear Senator Stewart: This letter is submitted as a part of the Hearing Record on S. 2820. Opposition testimony contained many erroneous statements. The purpose of this letter is to present evidence to refute some of those statements.

1. Statement by Cary Fowler, "In recent years some 50 once-independent seed companies have been acquired principally by large multinational drug and chemical firms . . ." followed by a listing containing the following erroneous representations:

a. Anderson Clayton (ACCO) did not purchase Paymaster Farms. Paymaster Farms was started by Anderson Clayton in 1929 with the purchase of 80 acres of land and the employment of one cotton breeder.

b. International Multifoods was reported as the purchaser of two companies, Baird, Inc. and Lynk Brothers, when, in fact, Lynk Brothers and Baird was a partnership dating back to 1944, the name of which was changed to Lynks Hybrids in 1976.

c. Union Carbide is reported to have acquired Ferry-Morse which is not correct. Ferry-Morse has been a division of Purex for many years.

d. Upjohn was reported to have purchased two companies, Asgrow Seeds and Associated Seeds, when, in fact, Asgrow Seed Company and Associated Seeds are the same company. Associated Seeds was originally known as Associated Seed Growers, Inc., a company in existence prior to 1883 with the name having been changed to Asgrow Seed Company in 1960.

A complete and accurate analysis of mergers and acquisitions in the seed industry would show, on the basis of (a) year of acquisition or merger, (b) the involvement of the acquired company in hybrid crops, not protectable under the PVP Act, and (c) the influence of inheritance and tax laws on the sale, that the Plant Variety Protection Act has been of much less influence on changes in the seed business than claimed by opponents of the legislation.

2. Testimony of Cary Fowler with reference to FAO policy guideline paper dated 2/28/80. A letter was directed to FAO to obtain a copy of the "FAO Organization Policy Guideline Paper" quoted in the testimony. A copy of the correspondence has been submitted for the record. The following statement from the response denies that the statement in the testimony is the offcial position of FAO:

"A problem of this importance is, of course, discussed between concerned units of FAO (Plant Production, Forestry, Legal Council, etc.) and their various views, proposals, etc. are reflected in the exchange of internal memoranda, technical documents, etc. The quotation which you have mentioned is, in fact, part of such internal working papers, but it does by no means represent the official position of FAO on the subject."

3. Testimony by Cary Fowler that "all cereal varieties in the United Kingdom are patented"—Correspondence with U.K. officials, copy of which has been submitted for the record, prove this statement to be a misrepresentation of the facts.

4. Testimony by Cary Fowler that "only 5 percent of the varieties offered for sale in Germany are not patented"—Correspondence with German officials, copy of which has been submitted for the record, state that, in fact, 91.6 percent of agricultural crop varieties and only 66.1 of vegetable varieties are protected.

The above does not, by any means, represent all of the incorrect statements in the testimony presented in opposition to S. 2820, but is indicative of the inaccuracy of the testimony of those who oppose the legislation.

I have not been able to develop information to respond to your concern on the structure and concentration in the U.S. seed industry. A quantitive analysis would be possible only by developing information for each acquisition or merger; however, such information is confidential and not available for publication. This matter was discussed with Mr. L. William Teweles, a consultant to companies in the seed industry and active in many of the seed company mergers and acquisitions during the past ten years. Mr. Teweles made the following statement relative to the seed industry:

"As is the case in many other industries, our state and federal tax climate and lack of succession are largely responsible for many privately-owned seed companies selling out to larger firms. In the case of several acquisitions by non-U.S. companies, the relative value of the U.S. dollar, the large U.S. market, and the free enterprise stability of America has encouraged offshore purchasers.

"It is interesting to note that several large corporations that have acquired seed companies in recent years have found that the seed trade did not fit into their strategic objectives and they have resold their acquired company."

I will be glad to respond to any questions you have.

Respectfully submitted.

Harold D. Loden,
Executive Vice President.

American Seed Trade Association, Inc.,
Washington, D.C., June 19, 1980.

Dr. Walter P. Feistritzer,
Senior Officer, FAO–AGPC, Rome, Italy.

Dear Dr. Feistritzer: During hearings in the U.S. Senate on June 17 reference was made to a "United Nations Food and Agriculture organization policy guideline paper" dated February 28, 1980 which states in part:

"While the Convention (UPOV) may have been established to protect the rights of plant breeders, it has in fact contributed to an excessively monopolistic atmosphere in plant breeding in developed countries, which has had negative effects on the complex structure of international plant breeding. An important example of such negative effects recently encountered by FAO and the UN System has been the restriction of the free exchange of some categories of germ plasm."

Would it be possible for you to send me a complete copy of this official FAO document?

With kindest personal regards, I am

Very truly yours,

Harold D. Loden,
Executive Vice President.

Food and Agriculture Organization of the United Nations,
July 2, 1980.

Dr. H. Loden,
Executive Vice President, American Seed Trade Association, Inc.,
Washington, D.C.

Dear Dr. Loden: Many thanks for your letter of 19 June and the attached list of Representatives of the ASTA International Committee.

I have brought your question on FAO's official position regarding the issue of plant breeders rights to the attention of Dr. Brauer, Director-Plant Production and Protection Division. I understand that Dr. Brauer has already requested our External Relations Unit to inform you on FAO's offical position on the subject.

With best regards.

Yours sincerely,

W. P. Feistritzer,
Plant Production and Protection Division.

Food and Agriculture Organization of the United Nations,
July 4, 1980.

Mr. H. D. Loden,
Executive Vice President, American Seed Trade Association, Inc.,
Washington, D.C.

Dear Mr. Loden: I wish to refer to your letter of 19th June to Dr. Feistritzer concerning FAO's position on plant breeders rights which has been passed to this Unit for reply. I would like to inform you of the situation with regard to this very actual, but also rather complex matter with existing and potential far reaching implications.

FAO is constantly reviewing the question of plant breeders rights, but in view of the complexity of the subject, FAO has not at this time adopted a position concerning plant breeders rights. It has noted that those rights do not provide any basis for restrictions on the access by developing countries to the sources or results of plant breeding activities. It has also noted that plant breeders legislation tends to encourage the development of the new plant varieties by the private and public sectors, which can have beneficial effects for the world as a whole. At the same time it has taken note of certain fears related to restrictions on the free exchange of germ plasm.

A problem of this importance is, of course, discussed between concerned units of FAO (Plant Production, Forestry, Legal Council, etc.) and their various views, proposals etc. are reflected in the exchange of internal memoranda, technical documents etc. The quotation which you have mentioned is, in fact, part of such internal working papers, but it does by no means represent the official position of FAO on the subject.

Yours sincerely,

B. Sestan,
Chief, External Relations Unit,
Office for Interagency Affairs.

American Seed Trade Association, Inc.,
June 19, 1980.

Mr. P. W. Murphy,
Controller, Plant Variety Rights Office, Ministry of Agriculture, Fisheries and Food,
Cambridge, England.

Dear Pat: During testimony to the U.S. Senate during hearings on June 17, the following statement was made by one of the opponents to the legislation:

"All cereal varieties in the United Kingdom are patented."

Could you please confirm if the above statement is true? Your early response to this question would be appreciated.

With best regards, I am

Very truly yours,

Harold D. Loden,
Executive Vice President.

The Plant Variety Rights Office,
Cambridge, England, June 27, 1980.

Mr. Harold D. Loden,
Executive Vice President, ASTA,
Washington, D.C.

Dear Harold: Thank you for your letter of 19 June.

In paragraph 15 of the paper which I submitted to the de la Garza Committee, I made the point that virtually all the cereal varieties included on our recommended lists are subject to plant breeders' rights. This is not surprising, since the varieties concerned have resulted from breeding programmes instituted since the 1964 Act came into force. They are therefore the direct result of the introduction of plant breeders' rights in the UK.

It is not however true to say all the cereal varieties marketed in the UK are protected. Currently there are 156 varieties of wheat, barley and oats on the UK National List, 144 of these are protected, while 12 (5 wheats, 3 barleys and 4 oats) are not. It is generally the pre-1964 varieties which are not protected, e.g. PROCTOR barley, which occupied such a huge percentage of the UK spring barley crop in the 1950s and early '60s. These varieties have now been superseded by improved varieties resulting from the expanded breeding programmes initiated by plant breeders following the introduction of the 1964 Act.

Best wishes,

Yours sincerely,

P. W. MURPHY.

AMERICAN SEED TRADE ASSOCIATION, INC.,
June 19, 1980.

Dr. D. BORINGER,
President, Bundessortenamt,
Hanover, Germany.

DEAR DR. BORINGER: In testimony presented to the U.S. Senate this week the following statement was made by one of the opponents to the legislation to amend the U.S. PVP Act:

"In West Germany, only 5% of the varieties offered for sale are not patented."

Would you please confirm if this is a true statement. Your prompt reply to this request would be appreciated.

Sincerely,

HAROLD D. LODEN,
Executive Vice President.

BUNDESSORTENAMT,
3 Hannover 72, June 27, 1980.

Mr. HAROLD D. LODEN,
Executive Vice President, ASTA,
Washington, D.C.

DEAR MR. LODEN: Thank you for your letter of 19 June 1980. I will give you the following figures which refer to the situation of 1 April 1980:

As far as agricultural crops are concerned 91,6% of the varieties in our National List are protected by plant breeders' rights.

As far as vegetables are concerned 66,1% of the varieties in our National List are protected by plant breeders' rights.

The precise figures for each species you can get from our official gazette of 15 April 1980. A copy of it may be available for you in the office of Mr. Leese in Beltsville.

With kind regards,

Yours sincerely,

D. BORINGER.

AMERICAN SEED TRADE ASSOCIATION, INC.,
Washington, D.C., August 20, 1980.

Hon. DONALD W. STEWART,
Chairman, Subcommittee on Agricultural Research and General Legislation, Senate Committee on Agriculture, Nutrition, and Forestry, Russell Senate Office Building, U.S. Senate, Washington, D.C.

DEAR SENATOR STEWART: This letter is submitted as a part of the Hearing Record on S.2820. Testimony presented by Mr. Jack Doyle, of the Environmental Policy Center the following statement was made:

"Already in the U.S., for example, the four firms which dominate the hybrid seed corn market—controlling between 62 percent and 68 percent of that market—appear to have specialized in certain regions of the country. DeKalb, Sandoz, Ciba-Geigy, and Pioneer each have a good share of the seed corn market in separate and distinct areas of the U.S. Little data exists on these kinds of patterns, but is certainly needed for all agricultural crops if we are to know the full extent and potential for corporate control of seed marketing and distribution in this country."

This statement implies a deliberate effort by major hybrid seed corn companies not to compete in the same area. This implication is untrue and could be refuted by giving market share for each company in the various states; however, such information is confidential and not available for the public record. We have developed other information to refute this statement and prove that each of these companies competes in all major corn producing areas.

The attached table indicates the number of sales outlets for each of the companies in states planting more than 1,000,000 acres of corn. A comparison is made in the number of sales outlets per 100,000 acres planted. In all states with more than 2,000,000 acres of corn the figures are very comparable. In states with less than 2,000,000 acres the data are more variable, the principal reason being that in the southeastern states, dealers may sell seed from several companies, whereas in the Corn Belt, dealers tend to sell only one company's product. The number of sales outlets for Northrup King in each state is generally greater than the other companies since the data for Northrup King includes dealers who may sell only vegetable or lawn seed, products which are not included in the product line of the other three companies.

Another positive indicator of competition is the location of research facilities. Market penetration is highly correlated with research efforts to develop varieties to meet the specific requirements of the area. The attached maps showing the research locations for Northrup King, Pioneer, DeKalb, and Funk are evidence that all of the companies conduct research programs to serve all of the major corn producing states. Differences in market shares between the companies is due to market acceptance of their product and not the result of an intentional effort not to compete.

I trust this information will serve to show that the hybrid seed corn industry is highly competitive and that there is no effort to concentrate sales and research efforts in "separate and distinct areas".

I will be pleased to respond to any questions you may have.

Respectfully submitted.

Harold D. Loden,
Executive Vice President.

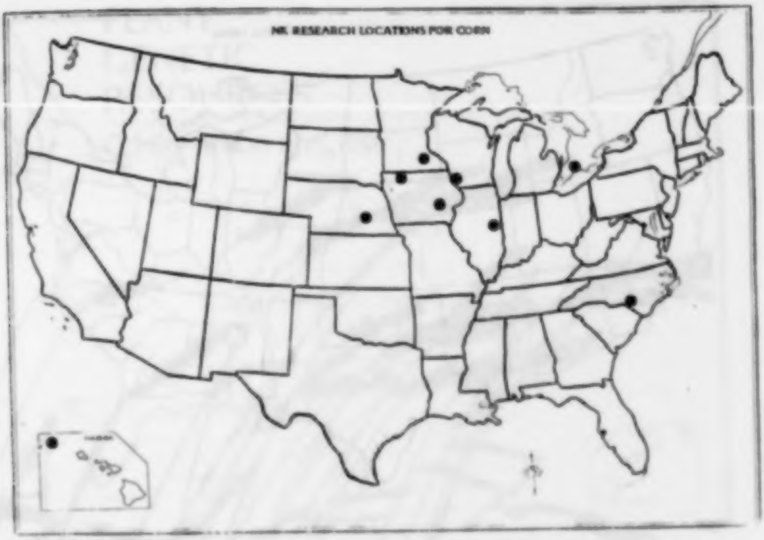
Enclosures.

1980 PLANTED CORN ACREAGE

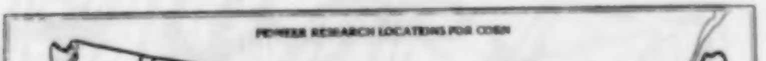
State	Area planted	Sales outlets per 100,000 acres planted			
		Northrup King [1] (Sandoz)	Pioneer	DeKalb	Funk (Ciba-Geigy)
Iowa	14,000,000	9	4.4	5.1	4.8
Illinois	11,400,000	7	7.6	6.9	5.3
Nebraska	7,650,000	8	5.3	5.4	4.4
Minnesota	7,250,000	14	5.0	7.3	5.0
Indiana	6,450,000	10	5.8	6.8	8.4
Wisconsin	4,200,000	18	8.4	7.8	9.1
Ohio	4,150,000	6	9.0	8.9	6.9
South Dakota	3,480,000	12	5.4	5.7	4.8
Michigan	2,950,000	9	6.0	9.4	8.4
Missouri	2,500,000	10	13.0	12.3	13.4
North Carolina [2]	1,900,000	11	64.1	7.9	28.8
Kansas	1,790,000	17	17.7	17.4	6.5
Pennsylvania	1,700,000	0	10.2	10.4	15.5
Georgia [2]	1,650,000	22	37.5	8.3	44.1
Kentucky [2]	1,650,000	11	17.8	11.2	5.0
Texas [2]	1,500,000	43	18.7	17.5	55.7
New York	1,350,000	0	7.0	11.2	12.5

[1] Numbers of dealers for Northrup King higher since it includes dealers for a complete line of seed and not only those which sell corn.

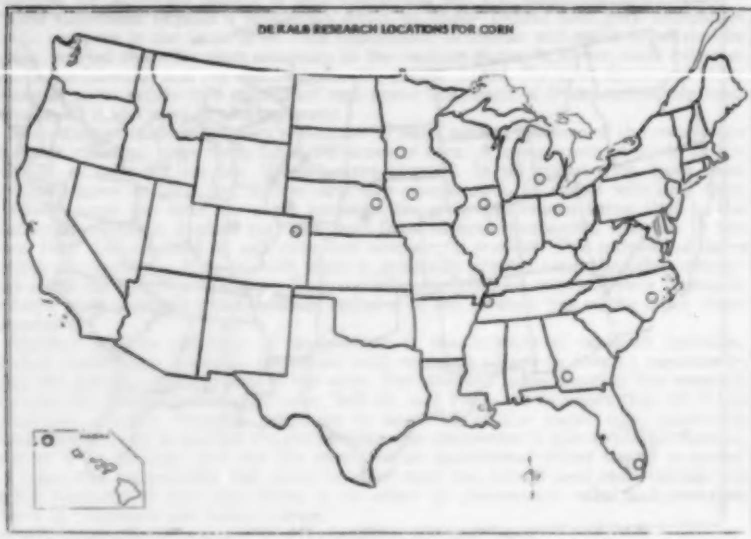
[2] Numbers of dealers in these States higher per 100,000 acres of corn planted due to method of distribution in which dealers sell corn hybrids from several companies.



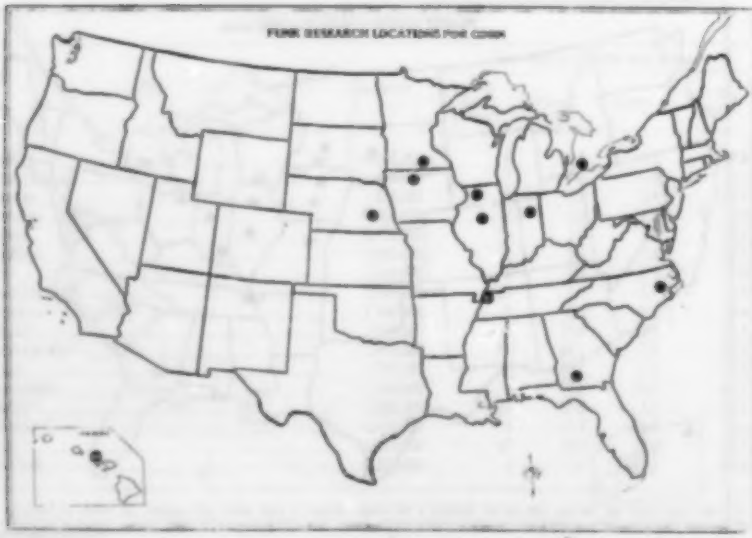
NK RESEARCH LOCATIONS FOR CORN



PIONEER RESEARCH LOCATIONS FOR CORN



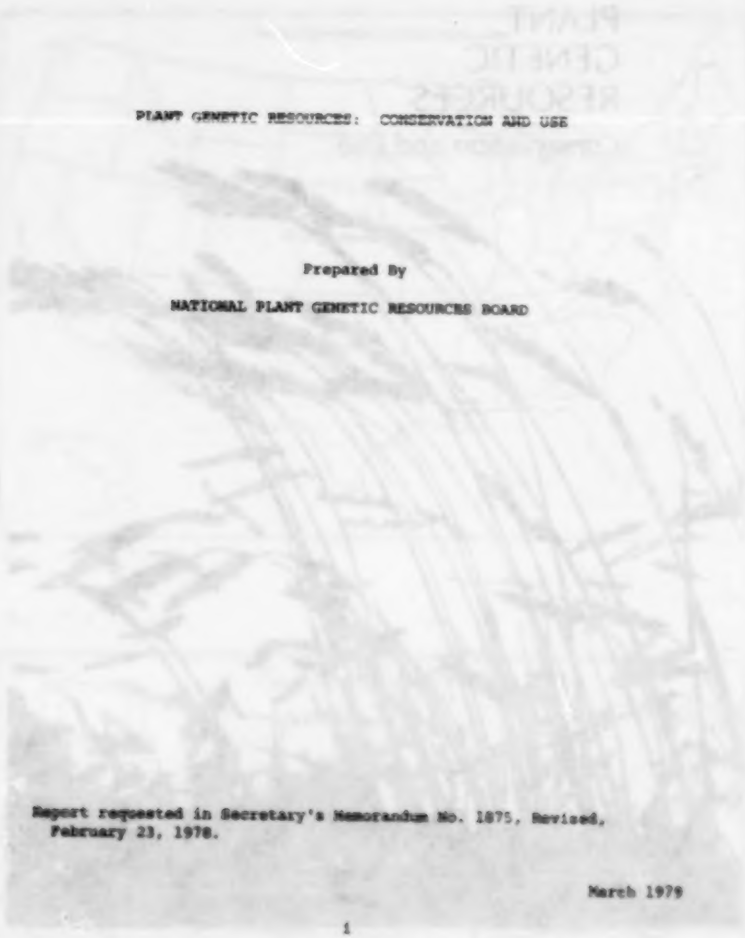
DE KALB RESEARCH LOCATIONS FOR CORN



FUNK RESEARCH LOCATIONS FOR CORN

PLANT GENETIC RESOURCES

Conservation and Use


PLANT
GENETIC
RESOURCES
Conservation and Use

PLANT GENETIC RESOURCES: CONSERVATION AND USE

Prepared By

NATIONAL PLANT GENETIC RESOURCES BOARD

Report requested in Secretary's Memorandum No. 1875, Revised, February 23, 1978.

March 1979

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MEMBERS OF NATIONAL PLANT GENETIC RESOURCES BOARD

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L. Sterling Wortman, Vice President, The Rockefeller Foundation, New York, NY

UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

February 23, 1978

SECRETARY'S MEMORANDUM NO. 1875 REVISED

NATIONAL PLANT GENETIC RESOURCES BOARD

The Secretary of Agriculture hereby reestablishes the National Plant Genetic Resources Board. The task of the Board is to advise on the assembly, description, maintenance, and effective utilization of the living resources represented by crop cultivars, primitive and wild forms of our crops. These resources are necessary for plant scientists to have the genetic variability necessary to cope with problems of today and the future.

The Plant Genetic Resources Board objectives are to advise the Secretary of Agriculture and officers of the National Association of State Universities and Land Grant Colleges in order to assess national needs and identify high priority programs for conserving and utilizing plant genetic resources including such things as collection, maintenance and description of genetic stocks, and utilization of the stocks in plant improvement programs.

The duties of the National Plant Genetic Resources Board are (1) to inform themselves of domestic and international activities to minimize genetic vulnerability of crops; (2) to formulate recommended actions and policies on collection, maintenance and utilization of plant genetic resources; (3) to recommend actions to coordinate the plant genetic resources plans of several domestic and international organizations; (4) to recommend policies to strengthen plant quarantine and pest monitoring activities, and (5) to advise on new and innovative approaches to plant improvement.

The Board will meet at least twice each year and possibly more often. The estimated annual operating costs are $400 for support; $6,600 for assisting in operation of committee; $17,000 for travel expenses, including per diem or subsistence incurred by committee members and Department employees; $13,000 from sources outside the government; and 0.3 man years. This estimate includes all private and public funds to be spent by or on behalf of the Board.

Members of the Board will be appointed by the Secretary. Pursuant to the provisions of Public Law 95-113, the Board shall, to the extent practicable, have ethnic, racial, and sexual balance. Membership on the Board will be composed of individuals with diverse capabilities distinguished by their knowledge and interest in plant genetic resources management.

In the event the Board tenure is over a period of years, partial rotation of membership would be practiced every two years to provide for continuity and broad representation on the Board.

The Assistant Secretary for Conservation, Research and Education will be Chairman. Dr. William L. Brown, President of Pioneer Hi-Bred International, Inc., Des Moines, Iowa, will be Vice Chairman. The Executive Secretary will be provided by the Science and Education Administration.

The Board shall report to the Secretary of Agriculture through the Assistant Secretary for Conservation, Research and Education, with particular assistance from the Director of the Science and Education Administration. The Director will provide support for the operations of the Board.

The functions of this Board cannot be performed in less than two years, and establishment of the Board is considered in the public interest. No existing committee can perform these functions, nor can the Department take effective unilateral action in view of the diversity of interested groups, and as such will serve an essential function.

This memorandum also serves as the charter for the Board.

In accordance with regulations for Federal advisory committees, the Board shall terminate two years from the date of this memorandum. The Department would like to (1) ensure continuity and increased involvement of the Board in genetic resources planning and coordination activities, (2) increase the association of the activities of the Board with genetic resource programs of State and private industry research organizations, and (3) expand the scope of the Board to relate to other kinds of genetic resources of great interest to agriculture. Accordingly, the Assistant Secretary for Conservation, Research and Education is directed to submit recommendations to me by July 1, 1978, about ways in which these objectives can be achieved.

Secretary's Memorandum No. 1875, dated July 3, 1975, is hereby superseded.

/signed/ Bob Bergland

Secretary of Agriculture

MEMORANDUM

TO: Secretary Bergland

FROM: National Plant Genetic Resources Board

The National Plant Genetic Resources Board was appointed by the Secretary of Agriculture in 1975 and reappointed in February 1978. NPGRB was a direct outgrowth of the alarm caused by the southern corn leaf blight which spread swiftly over the corn crop in 1969 and 1970 reducing yields 50 percent in some States and an estimated 15 percent nationwide.

The southern corn leaf blight of 1969-70 was not the first plant disease epidemic to strike an important crop but it was the first to shock a nation into the realization that many of our major crops rest on a narrow genetic base and consequently are highly vulnerable to attack by new forms of disease and insect pests. The southern corn leaf blight experience also resulted in the initiation of a series of studies designed to answer the questions as to how to reduce the probability of future epidemics and how to best cope with them should they occur. These are questions to which the NPGRB has addressed itself since 1975.

The accompanying report describes a seven phase program for minimizing genetic vulnerability which, if implemented, would make possible the proper conservation and utilization of the vast reservoir of plant germplasm. The total germplasm would probably contain the traits (genes) required to successfully cope with most pest problems, and its use would greatly increase the genetic base of those crops the nation depends upon for most of its food and fiber.

Examples of what might be expected to be accomplished through the program herein described are:

1. Pest management by genetic means.

Through the years agriculture has depended largely upon the use of chemical pesticides to control insects and diseases of plants. The system has been reasonably effective but the effects of some of the more persistent chemicals on the environment have now become a matter of national concern. The safest alternative to the chemical control of pests is the development and use of genetically resistant cultivars. These are developed by conventional breeding techniques. The sources of resistance are frequently found only in "exotic" varieties — those found only in other parts of the world. Examples of the successful use of this method are green bug resistance in sorghum, anthracnose and head smut resistance in sorghum derived from tropical sorghums of Africa, and resistance to corn leaf blights from materials introduced from South Africa and South America.

2. Food quality and safety.

Most plant breeding has been directed toward the improvement of yielding ability and other agronomic traits that affect yields either directly or indirectly. Increased attention needs to be given to nutritive quality and food safety. To do so effectively requires the screening and evaluation of a broader range of germplasm than is present in the normal arsenal of materials with which breeders work. Expanded research in the area of food quality and safety would be an integral part of the program recommended in the accompanying report.

3. Increase in genetic diversity.

For various reasons the farmer, processor, distributor, and consumer demand uniformity in crop varieties and food products. The plant breeder has met these demands for uniformity but in so doing has decreased the genetic diversity of our major crop species. Unfortunately, a decrease in genetic diversity is frequently accompanied by an increase in genetic vulnerability and an increased risk of economic loss caused by some new parasite, insect pest, or unusual environmental stress. It is imperative, therefore, that attempts be made to restore a necessary measure of genetic diversity through the use of new and unrelated sources of germplasm.

The central point is that the conservation and use of plant genetic resources through the application of classical plant genetics and breeding, as shared among State, Federal, and industry groups, has been and continues to be a most cost effective investment of public and corporate funds. In recent years public support for this research has declined while newer, more glamorous trends have enjoyed high priority. Our fundamental appeal is that the tried and true should not be abandoned in favor of newer, but only potentially useful approaches.

RECOMMENDATIONS

1. The Board recommends that the Department assign high priority to the reestablishment of U.S. crop authorities. This is not a priority that requires a new budget. It entails the formation of committees (or the use of appropriate existing committees) under the jurisdiction of Science and Education Administration to (1) monitor breeding progress nationally and internationally, and (2) make recommendations for implementing the work broadly outlined in the Board's report.

2. We also recommend that high priority be given to additional support for the genetic improvement of cultivated crops. This recommendation does require budget and personnel to work on basic genetics, taxonomy, cytology, developmental breeding, and new methods to evaluate materials for food quality and safety, as well as resistance to pest and environmental stresses.

We urge that these two recommendations (the reestablishment of the U.S. crop authorities and increased support for the traditional aspects of breeding and genetics) constitute a primary budget thrust in 1981. We believe such a budget package could be developed through the regular USDA-SEA budget process with funds for implementation going directly to Agricultural Research and Cooperative Research.

January 11, 1979

best copy available

ABBREVIATIONS

AR - Agricultural Research

ARPAC - Agricultural Research Policy Advisory Committee

CR - Cooperative Research

GRIP - Germplasm Resources Information Project

IBPGR - International Board for Plant Genetic Resources

LISA - Laboratory for Information Sciences in Agriculture

NAS - National Academy of Sciences

NIH - National Institutes of Health

NPGRB - National Plant Genetic Resources Board

NPGC - National Plant Germplasm Committee

NPGS - National Plant Germplasm System

NRC - National Research Council

NSF - National Science Foundation

NSSL - National Seed Storage Laboratory

SEA - Science and Education Administration, U.S.D.A.

USAID - United States Agency for International Development

SUMMARY

Most food and fiber crops produced in the United States have their origins from the plants brought to this country by the earliest settlers and, in more recent times, by plant explorers.

The United States has a long history of plant introduction. It evolved through various stages beginning with American consuls overseas who sent back seeds of useful plants to the United States. The present National Plant Germplasm System is a coordinated network of institutions and agencies (State, Federal, and private) working cooperatively to introduce, maintain, evaluate, catalog, and distribute plant germplasm.

The success of modern crop varieties, the explosion of the world population, and the disturbance to ecosystems by the industrial revolution have tended to reduce the amount of genetic variability in plant genetic resources.

Improvement of crop varieties through plant breeding has been a major catalyst of the agricultural revolution of this century. Breeding to meet constantly evolving requirements for higher yield; resistance to insects, diseases and environmental stresses; better nutrition; safer food; and biomass production, demand a well planned system for the conservation, maintenance, and utilization of a wide assortment of plant genetic resources. Such a system is crucial to the future well-being of this country and responsibility for it must rest squarely with the U. S. Department of Agriculture.

Genetic vulnerability is the term used to describe epidemic losses, which happened, for example, with southern corn leaf blight in 1970. No program can reduce the probability of epidemics to zero; however, the best approach to lowering the probability or solving the problem, should one arise, is to have a sound program in all seven phases of the research and development activities for conserving and using plant genetic resources.

This report describes a seven-phase program for conserving and using plant genetic resources. The program includes plant introduction, classification, screening, basic genetics, developmental research, applied research, and finally production of seeds of improved varieties for sale to farmers.

This seven-phase program represents an outstanding example of State, Federal, and private industry cooperation and planning. The program has been and continues to be extremely successful, but it tends to receive low priority ratings in the budget process in spite of the fact that it is fundamental to all agricultural missions. Plant germplasm resources and their use are central to a multitude of national goals, including increasing exports; boosting farm income and enhancing the national economy; protecting the environment; conserving energy; helping with soil conservation; minimizing cost of food; providing safe, nutritious food; developing pest-resistant crops and crops better adapted to less favorable environments, and minimizing cost of building materials and other forest products.

This report also presents the following objectives with specific recommendations for achieving them:

- I. **Improvement of the U.S. National Plant Germplasm System.**
- II. **Reestablishment of Preeminence of U.S. Crop Authorities.**
- III. **Genetic Improvement of Cultivated Crops.**
- IV. **Support of the National Plant Genetic Resources Board.**
- V. **Liaison with Other Organizations.**

PLANT GENETIC RESOURCES: CONSERVATION AND USE

RECOMMENDATIONS

I. Improvement of the U.S. National Plant Germplasm System

1. **Recognize that the seven-phase program described in the NPGRB report of 1978 is an outstanding example of State, Federal, and industry coordination and cooperation for the achievement of common national goals of high priority.**

   Recognize that, while nitrogen fixation, photosynthesis, and genetic engineering now enjoy favorite trendword status and they are important research areas, genetics and plant breeding work, using established methods, should be ranked as high or higher in priority.

   Recognize that plants developed by recombinant DNA technology or protoplast fusion must be used in the seven-phase program before agricultural benefits are realized.

   Assign high priority to the seven-phase program outlined in this report in the FY 1980 and subsequent budgets.

2. **Authorize SEA, in cooperation with NSF, to explore policies and procedures necessary to provide adequate continuing support for the acquisition, maintenance, and distribution activities involving genetic stock collections of all significant crop species.**

3. **Support AR- and CR-SEA in the following ongoing programs recommended by the NPGC:**

   (1) Construct a system of clonal repositories for fruit and nut crop germplasm.

   (2) Continue the development and implementation of a comprehensive information system. This work is currently underway and is called the NPGC-GRIP project.

4. Establish a temporary committee under the Joint Council for the purposes of (1) estimating U.S. manpower requirements in germplasm biology, and (2) recommending an adequate national training program in germplasm biology consistent with need. We would hope this committee could complete its report by May 1979.

II. Reestablishment of Preeminence of U.S. Crop Authorities

5. Establish and finance a committee, or use an existing committee, of genetic resource experts on each important crop (or groups of minor crops where that seems desirable) to:

    (1) Monitor the collecting and breeding progress of other nations and/or international agricultural research institutes.

    (2) Make specific recommendations on introductions and plant explorations.

    (3) Recommend maintenance procedures and responsibilities.

    (4) Suggest research programs to make maximum use of germplasm resources for the benefit of producers and consumers in the United States.

    (5) Periodically report (at least every five years) on the state of efforts in the United States and the world to improve productivity of the species or to tailor materials for potential world market. (Out of such work should emerge U.S. authorities on each significant species, individuals with both national and international perspectives. The U.S. is now extremely weak in this regard.)

    (6) Form such commodity committees under jurisdiction of SEA, USDA. (Formation of such crop committees is one of the more important and immediate actions which could be taken by this administration to assure that producers and consumers in the United States benefit to the maximum from both the scientific effort in the United States and that now developing so rapidly abroad.)

III. Genetic Improvement of Cultivated Crops

6. Assign high priority both to developmental breeding and to understanding of genetic systems of each important crop species.

    Establish crop improvement teams with at least one plant breeder, pathologist, and entomologist on each team. Some teams should also have a basic geneticist and soil scientist.

Provide scientists with technical help to screen, in both fields and laboratories, large numbers of stocks in the germplasm inventory.

Provide resources to rapidly and economically measure characteristics important in food safety, nutrition, pest resistance, and product quality.

Conduct research on the technology of evaluating materials for pest resistance and tolerance to environmental stresses.

Provide that the funds for this area of work be flexible and permit rapid expansion when new disease, insect, or stress problems arise. A strong backup program is necessary to offset the prevalence of vertical pest resistance in major crop cultivars.

7. Support and promote basic studies in genetics and other fields that contribute to an understanding of the genetic makeup of each significant crop species and their interspecific relationships.

IV. Support of the National Plant Genetic Resources Board

8. Take steps to extend appointment of the NPGRB beyond February 1980; do so in time to assure unbroken tenure of the Board.

Provide the Board with a full-time Executive Secretary with clerical staff and support.

Expand the scope of the NPGRB to include forest germplasm resources.

Coordinate the activities of the NPGRB with those of the IBPGR and other national and international programs. Invite a member(s) of IBPGR to attend NPGRB meetings.

V. Liaison with Other Organizations

9. Continue the close liaison among public agencies and with such organizations as the American Seed Trade Association, National Council of Commercial Plant Breeders, Association of Official Seed Certifying Agencies, and other organizations concerned with providing a reliable supply of improved, high-quality planting seed to the consuming public.

Encourage the NPGRB to maintain liaison with agricultural research foundations, industry, IBPGR, lesser developed countries, and others advancing the cause of American and world agricultural production.

I. INTRODUCTION

Lack of Native Crops in the United States

If American consumers were asked to live on food from crops native to the United States, they would probably be shocked that their diet was limited to sunflower seeds, cranberries, blueberries, strawberries, pecans, and not much else. Bread, cereals, potatoes, fruits, and vegetables would be missing from their tables. Tobacco would be available, but they would have no cotton or flax textiles for clothing and linens. If the United States had to import the food we eat and fiber used to clothe and house us, this would make our balance of payments for oil look small by comparison. Fortunately, we do not import food and fiber directly; however, resources that support our domestic food and fiber production are imported.

Without the systematic introduction and use of germplasm resources the average acre yield of corn could not have risen 320 percent from 1930 to 1975. Moreover, the energy required to produce the 1975 corn crop would have increased oil imports by millions of barrels if yield per acre had remained at the 1930 level.

Long History of Plant Introduction

In precolonial and colonial days the early settlers found few of the crops they had known in the Old World. The Indians grew some corn, beans, and squash; however, these crops had been brought into the future United States much earlier by Indian tribes from what is now Mexico.

In the early settlement days immigrants to the United States quickly learned that they had better bring seed with them. The U.S. Government early recognized this paucity of seed and encouraged the search for seed of adaptable crops. In 1819, American consuls overseas were asked to collect seed of useful plants and send them to the United States. From 1836 to 1862 the U.S. Patent Commissioner administered the introduction of plants. In 1862 the U.S. Department of Agriculture was established. Since that time various agencies of the U.S.D.A. have accelerated plant exploration and plant introduction activities.

The Current Challenge for Food and Fiber

The United States and the world face many agricultural challenges now and in the future. During the past 60 years the population of the world has grown from over a billion-plus to 4 billion. It has been predicted that the population may reach 6 or 8 billion by the end of this century.

Repeated studies have shown that if the human family expects to feed its burgeoning numbers, "We have to find in the next 25 years, food for as many people again as we have been able to develop in the whole history of man 'til now" (Jean Mayer 1975). In addition to this humanitarian aspect, bountiful and secure agricultural production is essential for the welfare and economic prosperity of nations.

Before the dawn of recorded history people began to become less dependent on hunting and foraging by turning to the cultivation of plants. Throughout the centuries plants judged to be superior were saved for propagating subsequent crops, some of which were doubtlessly chance or man-made hybrids. Thus, a vast number of "folk" varieties were developed in all parts of the world. Great genetic variability existed within and among these varieties. Moreover, that portion of species not chosen for cultivation generally survived in nature, because the pressure of the human population and advanced agricultural technology had not yet destroyed their natural habitats. In this century the situation that existed so long has changed and continues to change rapidly.

Professional plant breeding began 60 or 70 years ago with the rediscovery of Mendel's laws and the development of the chromosome theory of heredity. By applying these scientific principles breeders developed modern crop varieties generally highly uniform and specialized for yield, quality, and adaptation to specific environments. The constant release of improved varieties and the adoption of advanced production technologies resulted in remarkable increases in agricultural productivity. The superiority of these modern varieties over folk varieties led to their widescale adoption in this country and in other parts of the world. Many old varieties were abandoned with serious loss of these important plant genetic resources. Genetic resources in the wild as well as those in cultivation as folk varieties are rapidly disappearing.

Responsible agricultural leaders in this country and abroad have recognized for many years that plant genetic resources were being lost and that genetic variability among varieties was being reduced. The urgency of the southern corn leaf blight epidemic of 1970 shocked the nation into considering the conservation and proper use of plant genetic resources as activities of first importance to its continued well being.

Tragic epidemics have occurred since Biblical times. Recent examples are the Irish potato famine of the 1840's, the Ceylon coffee rust epidemic in 1870, the United States wheat rust epidemic in 1916 and the Bengal rice epidemics in 1942. The destruction of chestnuts several years ago and the current attack by the pathogen causing Dutch elm disease add to the list. Droughts in India, Africa, and our own Midwest and Far West in recent years emphasize that crops are vulnerable to stresses.

The term "genetic vulnerability" was coined to explain the southern corn leaf blight epidemic of 1970. In the genetic vulnerability of crops, uniformity is the key factor. The probability of an epidemic is increased when large numbers of plants are genetically alike. If one becomes susceptible, all become susceptible.

Although genetic diversity offers some protection against epidemics it does not guarantee that one will not occur. Producers and consumers want improved varieties with high yields, good quality and uniformity of product. They want varieties that lend themselves to low production costs. Genetic diversity is sacrificed because everyone wants to grow the best variety. The farmers want to grow the variety that makes them the most money. The seedsmen and breeders want to breed the best variety and capture as much of the market as they can. Breeders tend to use the better varieties as breeding stocks for further advances, which in turn reduces the genetic variance among varieties. Mechanized farming requires uniformity of seeds, maturity, and plant height.

Breeders now tend to release varieties with greater genetic diversity within them than they formerly did when the "pure line" theory was more in vogue. This trend helps; however, genetic diversity within varieties planted, by itself, will not adequately minimize the risks. Genetic vulnerability may be minimized most effectively by a sound research program in each of the seven phases of the program described in this report. Thus, genetic vulnerability is not simply uniformity in the fields; it is related to such factors as our ability to respond quickly to unexpected conditions. Our ability to respond should be related to knowledge of the crops and their relationships to pests and physiological stresses.

In 1970 the fungus (Bipolaris maydis) causing southern corn leaf blight spread across the nation. Losses reached 50 percent in some States and 15 percent nationally. This threat to the existence of a major crop created so much alarm that the Agricultural Board of the NRC appointed a committee on Genetic Vulnerability of Major Crops. This committee considered (1) what caused the corn blight epidemic of 1970, (2) how vulnerable crops were to attacks by pests, and (3) what should be done to hold losses to low levels and reduce the probability of epidemics. The book "Genetic Vulnerability of Major Crops" was issued by the NAS in 1972. The chapter on "The Challenge of Genetic Vulnerability", said in part, "Two points are clear: (a) vulnerability stems from genetic uniformity; and (b) some American crops are on this basis highly vulnerable. This disturbing uniformity is not due to chance alone. The forces that produced it are powerful and they are varied. They pose a severe dilemma for the sciences that society holds responsible for its agriculture. How can society have the uniformity it demands without the hazards of epidemics to the crops that an expanding population must have?"

A partial answer to this question was provided in a special report by an ad hoc subcommittee of ARPAC, issued in 1973 by the U.S. Department of Agriculture and the National Association of State Universities and Land Grant Colleges. The subcommittee recommended that the Secretary of Agriculture appoint a National Plant Genetic Resources Board to assure the proper management of these national resources. A Board at this level was considered to be vital to the effective coordination of many efforts among public, private, and international groups.

In 1975 the Secretary of Agriculture established the NPGRB to advise him on national needs for the assembly, description, maintenance, and effective use of living resources in plant improvement programs. Secretary's Memorandum No. 1875 Revised, dated February 23, 1978, reestablished the Board.

Role of Plant Genetic Resources in Agriculture

Crop production can be improved in only two ways: (1) By improving the genotypes of the plants, and (2) by improving the environment through cultural practices and non-heritable protection from pests. All knowledge and practices must be channelled into these two mutually dependent avenues or they cannot influence production. Plant genetic resources are used in the first of the two ways to improve and sustain crop productivity.

Plant genetic resources extend from wild species to varieties in production. A program in agricultural research connects these extreme types of plant genetic resources. Because this work is scattered geographically, involves all crops and disciplines, and is shared by State and Federal agencies and industry, it is easy to miss the significance of the total program. The capability for the United States to carry out this work demands that the technical competence required in all areas of germplasm biology be assessed and that necessary steps be taken to insure its availability.

Genetic improvement of crops requires that plant genetic resources be collected, maintained, and used. The work may be divided into seven phases with the phases falling into a natural sequence, as follows:

(1) Collecting, maintaining, evaluating, documenting, and distributing plant genetic resources. This phase helps to provide the nation with the plant genetic resources to meet current and future needs. It is of primary interest to the NPGC.

(2) Understanding the genetic variability and geographic distribution of cultivated species and their taxonomic and cytological relationships with closely related species.

(3) Screening plant genetic resources for specific, desirable characteristics. This should be done in each relevant ecological region for such characteristics as pest resistance, maturity date, nutritive quality, photosynthetic efficiency, drought tolerance, adaptation to problem soils, and fruiting efficiency. Genes for accomplishing improvement objectives must be located; genetic variation for the characteristics must exist before progress through breeding can be made.

(4) Studying the genetic mechanisms controlling the inheritance of desirable characteristics. Such knowledge is required for determining breeding objectives, selecting parental materials, and choosing appropriate breeding methods.

(5) Combining genes from diverse sources into improved strains more useful to plant breeders. Genes for desirable characteristics are often found in stocks inferior to cultivated ones; they are seldom found within the same stock. This phase is sometimes called developmental breeding. It is a connecting link between basic and applied research, and it sorts out those objectives that have a high probability of success for applied breeding from a large number of possibilities.

(6) Breeding, releasing, and maintaining breeder seed of varieties and stocks of improved germplasm.

(7) Producing high-quality planting seed and distributing it to farmers. This is the ultimate objective of all the preceding phases because it makes available seeds (or other plant propagules) with the inherent capability for efficient production of high quality crops, well adapted to our environment and cultural practices, and with as much "built in" protection as possible from pests and environmental stresses.

These phases are best thought of as a continuum that sets up a gene flow from source to end use. Unless all phases are operating an imbalance or block develops. Continuous flow from phase to phase keeps high yielding varieties on the market; improves the quality of agricultural products; reduces dependence on pesticides, thus enhancing the environment; minimizes cost of production, and reduces vulnerability to pests and environmental stresses.

Society has great concern about the loss of species from the earth. The Endangered Species Act was passed to minimize the loss of species. The Nature Conservancy and other organizations are active in protecting life forms in preserves, zoos, and arboretums and in preventing environmental disturbances that may endanger the habitat of species. This is conservation at the species level. Many endangered species have no detectable use except that they are a part of the great interdependence of life forms in ecosystems. The disappearance of a species might cause an ecological shift unfavorable to esthetic values and even utility.

The NPGRB contends that society should be equally, if not more, concerned about the conservation of the genetic variability accumulated within economic species during the long evolutionary processes. After all, most of these species have demonstrated their usefulness since the dawn of agriculture. People are dependent on them for food, fiber, and some industrial materials for survival and on things of beauty for an enhanced quality of life. We will continue to encounter changing pest problems, changing concepts of food safety and human nutrition, growth in population, the need to grow crops in more environmentally stressed situations, and use of plants for biomass energy.

Plant genetic resources are maintained in four ways: (1) Most are maintained in natural ecosystems according to the "survival of fittest" principle. This material is just out there, with no inventory and no managed preservation scheme. (2) Folk varieties are cultivated generally by small farmers in lesser developed countries where modern professionally bred varieties do not dominate the agriculture. (3) Collections and materials are assembled by private corporations, professional research scientists, private collectors, hobbyists and amateurs. (4) Permanent collections are maintained in the public interest by governments.

Problems with the first two categories have been discussed. The third system is notoriously subject to abandonment, because originally interested curators retire, administrators object to the expense of maintenance, and institutional land and facilities are relocated. The third category also has limited use, because it is difficult to know who has what where, and information on the items is disorganized and inaccessible. Early in its history the United States decided that the first three maintenance categories were not trustworthy enough to provide for the plant resources for the cultivated crop species. The present form of our national scheme for maintaining plant genetic resources is known as the National Plant Germplasm System. The system has evolved over time, particularly since the Research and Marketing Act of 1946 established regional and interregional plant introduction stations with joint Federal and State funding.

II. RESEARCH AND DEVELOPMENT ACTIVITIES FOR CONSERVING AND USING PLANT GENETIC RESOURCES

Phase 1. Collect, maintain, evaluate, document, and distribute plant genetic resources.

This phase has received substantial attention by SEA-AR and SEA-CR in recent years. The high priority assigned to this work was stimulated in part by (1) the previously mentioned reports of NAS and ARPAC, (2) the world interest in the issue as expressed by the IBPGR publication, "Priorities among Crops and Regions," (IBPGR was established by the Consultative Group on International Agricultural Research "to insure that genetic variability in economic species of plants is conserved so that it can be used by plant breeders and by research workers interested in the evolution of cultivated plants and of agriculture itself"), (3) the NPGRB established by Secretary's Memorandum No. 1875, dated July 3, 1975, (4) the recommendations of the NPGC, (5) symposia on genetic vulnerability and germplasm resources of the 1975 annual meeting of the Crop Science Society of America, and (6) numerous articles in popular and scientific publications.

Tangible evidence of action includes (1) much better funding and staffing for the NSSL, Ft. Collins, Colorado, (2) a budget item in SEA-AR for plant explorations that allows 6 to 8 expeditions per year, (3) increased support for Regional Plant Introduction Stations and curators of specified germplasm, (4) development of the NPGS, (5) approval of National Research Program (NRP No. 20160), "Introduction, classification, maintenance, evaluation, and documentation of plant germplasm", and of Special Research Program "Genetic

Vulnerability", (6) commitment by SEA-AR and SEA-CR to develop facilities, staff, and support for a nationally coordinated system of clonal repositories for fruit and nut germplasm, (7) a cooperative agreement between SEA-AR and LISA, Colorado State University, Fort Collins, for the development and implementation of a computer-assisted information system to service the NPGS, and (8) the SEA-CR competitive grant program on genetic vulnerability.

The NPGRB surveyed the status of germplasm collections in ten crops and found deficiencies in existing collections, inadequate support for official curators of germplasm, and inadequate training of personnel with skills and interest in germplasm biology. Doubtlessly an analysis of other crops would reveal similar deficiencies.

Phase 2. Understanding the genetic variability and geographic distribution of cultivated species and their taxonomic and cytological relationships with closely related species.

Knowledge of the genetic structure of cultivated plants and of their genetic relationships with closely related species is essential for effective planning and execution of plant improvement programs. Concepts of interspecific relationships are developed from basic studies in many disciplines: genetics, cytogenetics, biochemistry, morphology, distribution, and ecology. Such information is required for the sound and workable taxonomy needed to catalog and use the large number of accessions in germplasm collections.

Genetics. In the study of the genetic architecture of crop plant species, linkage groups are mapped for the most clearly expressed marker genes. Also investigated is inheritance of quantitative and cytoplasmically determined characters. The methods exploit both spontaneous and artificially induced mutations. Studies of cellular genetics promote an understanding of the basic genetic makeup of a plant species and provide genetic lines that have immense potential for solving problems in physiology, morphological development, and plant biochemistry. These investigations are coordinated with studies of inheritance of economic traits visualized in Phase 4 and are inevitably integrated with those of cytogenetics.

Exotic accessions are also studied to determine their crossability with crop species and the characteristics of hybrids that might thereby be produced. These investigations determine the limits of hybridization, the nature of barriers to genetic exchange, fertility and viability of F_1 hybrids and later generations, and the extent of genetic and cytoplasmic differences between the parents. Not only is such information vital to biosystematists, but it also informs the plant breeder of the feasibility of using such accessions successfully.

Cytogenetics. Genetic analysis of a species is aided by coordinating it with the study of chromosomes. The chromosomal composition of a species is analyzed by employing cytological deviations from normal. Wild forms of the cultivated species and related species are routinely analyzed for chromosome number and morphology as aids in understanding natural relationships and the nature of barriers to gene exchange between taxa. Studying the relationship of meiotic chromosome pairing and fertility in diploid and polyploid hybrids often clarifies the nature of hybrid sterility and leads the way to the most efficient use of exotic germplasm.

Maintenance of genetic and cytogenetic special stock collections from economically important crop species is necessary for progress in research. The special stocks are also used in physiological and biochemical studies that are concerned with an understanding of plant growth and developmental processes. A recent NAS-NRC report entitled "Conservation of Germplasm Resources: an Imperative" recommends "that support by the NSF of important genetic stock centers and maintenance of germplasm resources through support from the NIH Division of Research Resources is very helpful and should be continued and expanded. Other agencies should consider adopting the policy of direct support of genetic stocks to assure their continued availability..." Genetic stock collections are uniquely useful as research tools and are not to be confused with the general germplasm collections that provide genetic variability for crop improvement. Currently support of genetic stock centers for crop species is divided between SEA and NSF, with little formal planning or collaboration. It would be desirable for SEA and NSF to review the problem of genetic stock maintenance in order to develop a policy of financial support adequate to the task. Such a policy might involve either transfer of funds or reassignment of responsibilities for certain stock centers.

Biochemistry. The literature has many examples of the use of biochemical constituents for studies of the classification and evolution of plant species. For example, differences in terpene content are of systematic interest in the pines as are storage proteins in the legumes. Besides aiding systematists, such determinations may reveal new sources of compounds with nutritional or industrial significance. The degree and pattern of variability of isozymes have already permitted analysis of interspecific and subspecific relationships. The nature of pest resistance, food safety, and nutritional quality are largely determined biochemically.

Morphology. Morphological characters furnish the data for classical taxonomy and often provide the only criteria for classification of herbarium specimens and field identifications. Qualitative characters are observed and quantitative characters are measured in the form of the whole plant or its parts. In plant germplasm assemblages the collection of such data is usually limited to characters of systematic and economic importance, but studies integrating morphology with the genetics are mutually beneficial.

Distribution. Information concerning geographic distribution often directs collectors to critical areas and distinguishes between wild and domesticated traits. The area of cultivation usually extends far beyond the native range; such differences can be significant in relation to the presence or absence of pests. Geographic isolation frequently expedites the differentiation of new biotypes and thus can be important in plant collecting expeditions. Weedy races may accompany the cultivated forms and play a significant role in the evolution and use of plant species.

Ecology. The distribution of a plant taxon is determined by its ecological preferences. Reproductive isolation can play an important role in evolution and thus be of interest to the systematists. Observations of the responses of plants to temperature, light intensity, photoperiod, soil type, and other factors in their native habitats and in first-trial plantings can give important information for the effective use of plant germplasm resources.

Continued research in these areas can provide the following benefits: (1) Determine the nature of genetic control of certain characteristics of interest to plant breeders, (2) reveal the opportunities and limitations of gene transfers from accessions to acceptable cultivars, (3) yield clues on the presence of useful characters, (4) ascertain the origin and sites of domestication, and (5) formulate a sound basis for classification.

Phase 3. Screen plant genetic resources for specific, desirable characteristics.

As plant genetic resources are collected or produced, they need to be screened to determine what characteristics they possess that are desirable for agriculture. As characteristics are identified, the germplasm is used as parental material for developing new genetic complexes. Each variety or population is characterized by a specific genotype or gene frequency. When crosses are made between strains of divergent origin, the F_1 generation may exhibit hybrid vigor and the F_2 generation of such hybrids may display genetic variability caused by the recombination of genetic material in new and unique genotypes. This provides further opportunity for the isolation of more efficient and desirable types.

Indepth screening is done by the users rather than the maintainers of the plant genetic resources. The potential value of germplasm collections depends upon the efficiency of techniques available or still to be developed that are designed to characterize the genetic differences among the individual items of a collection.

Ideally indepth screening should be done by crop-improvement teams made up of breeders, entomologists, pathologists, and soil scientists. Because of close ties with farmers, such a team would be aware of problems arising from an outbreak of a new pathogen or race or a new destructive insect. They could identify the causal agent involved and establish either the suitability of existing inoculating techniques or, if necessary, devise and evaluate new procedures. Such a team should have the field and laboratory facilities and the crop expertise necessary for success. The procedures necessary in any search for resistance are likely to be required to transfer such resistance to commercially useful varieties.

This team approach has a long history of success in discovering sources of resistance, for example, downy mildew in corn, the corn viruses, the several smuts and rusts of small grains, late blight in potatoes, spotted alfalfa aphid, and many others. Within the past 40 years the improvements in pest resistance of our major cultivated crops have been an important factor in increasing efficiency of our agricultural production.

Germplasm may also be screened for attributes other than disease or insect resistance. Possible attributes include: morphological variations contributing to increased yield; variation in quantity and quality of proteins, amino acids, or fats; the absence of toxic substances such as trypsin inhibitor in soybeans. Such a list could be extended indefinitely. Screening for desirable attributes of the type listed may require specialized equipment. Fortunately both apparatus and techniques are available for measuring many attributes of interest. Few of the procedures now available, however, have the capability or flexibility for handling the large numbers required for effective progress.

Phase 4. Study the genetic mechanisms controlling the inheritance of desirable characteristics.

The discovery of desirable characteristics in the screening phase is the first step in the use of the germplasm resource. If an effective strategy for using specific characters is to be developed, genetic analysis of the inheritance of specific traits and the quantitative analysis of population variability are essential prerequisites.

Breeders are urged to select various objectives by soil scientists, nematologists, pathologists, entomologists, and physiologists as well as farmers, food scientists, trade associations, processors, and consumers. Breeders face a bewildering choice of potential parental materials, and the science of plant breeding offers many breeding methods. If a good choice of objectives, materials, and methods is to be adopted, information is needed on the inheritance and genetic variability of desirable traits.

Phase 5. Combine genes from diverse sources into improved strains more useful to plant breeders.

Genes for desirable characteristics are usually found in stocks unsuitable for cultivation. Resistance to pests, ability to stand cold or drought, high protein content, improved amino acid balance, early maturity, and a host of other desirable features are seldom found together in stocks as an ensemble of the characteristics required for successful cultivation. Successful varieties have to have a composite of characteristics that makes them more profitable to grow than varieties already on the market. Building insect and disease resistance into superior varieties, a continuing struggle of science against nature, requires long-term, continuous work by competent entomologists, pathologists, and breeders. Such work is sometimes called developmental breeding, or exploratory research. This work connects germplasm collection, screening, and genetic analysis with applied breeding. From a large number of objectives that might be pursued, it sorts out those that have a high probability of success. It prevents the more applied programs from diverting their limited resources and time into unproductive efforts.

The work of the first four phases produces breeding materials that possess unique characteristics or unique combinations of genes with reasonably good agronomic or horticultural features. It is becoming more and more common for Federal and State agencies to release improved breeding stocks noncommercially so that appled breeders from any public, private, or lesser developed country may use the material at this stage.

Adaptation, or its lack, becomes an important problem in the transfer of desired traits from an exotic or wild strain to a commercially useful variety. Even though the genetic basis of the desired trait may be simple, the combination of specific characteristics with all other genetic traits affecting adaptation and field performance may result in a very complicated genetic system. The degree of complexity varies with the degree of dissimilarity of the parents used. Here, again, it appears that evaluation as well as screening can best be accomplished by a crop improvement team. It is in this phase that the recurrent evaluation of resource material being advanced toward cultivation becomes of utmost importance.

Evaluation of the relative merits of candidate strains and varieties is most often based on the results of a series of replicated performance trials over a period of years at several locations. The material is subjected to a sample of the environments that future varieties are most likely to encounter. This includes variation in soil type, nutrition levels, diseases, pests, weather, cultural practices, and harvesting methods. Although this type of field evaluation is still the best predictor of the future performance of any new variety, scientists often resort to evaluations in controlled environmental conditions. This is done to reduce the tremendous variation in weather and infestations that nature provides. For example, estimates of disease resistance are more reliable from artificial inoculations than from natural field conditions. Cold tolerance may be investigated in a temperature-controlled greenhouse or growth chamber.

Phase 6. Breed, release, and maintain breeder seed of varieties and stocks of improved germplasm.

The germplasm resource base for any crop involves a diverse assemblage of materials which may be roughly grouped as follows: (1) Currently useful varieties, (2) the very sizable reservoir of adapted but not currently utilized materials, (3) exotic and usually unadapted materials, and (4) the wild and weedy relatives. The problems relating to use increase in complexity with this progression. Plant breeding progress is most readily achieved when efforts can be confined to materials in groups one and two. Necessity, however, may require the use of materials from groups three and four.

Varieties are basically improved through a system of germplasm resource management. However, the majority of plant breeding experience and its foundation in quantitative genetic theory is based on studies with varieties and other adapted materials. The use of exotic and wild material poses a number of special problems for which neither theoretical nor practical answers are adequate. Recently funds for collecting and maintaining germplasm have been increased. These are necessary endeavors; however, if we are to move from a museum type of activity to one that recognizes vigorous utilization, adequate continuing support must be provided for crop improvement.

Crop yields in the United States over the past 45 years (1930-1975) have been remarkably upward. The following table shows the average yields of some field crops and major vegetables, as recorded in Agricultural Statistics, U.S. Department of Agriculture. The percentage increases from the original values range from 33 to 413 percent or about 1 to 9 percent per year on the average.

Average Yield Per Acre

	1930	1975	Unit	Percent increase
Wheat	14.2	30.6	Bushels	115
Rye	12.4	22.0	Bushels	77
Rice	46.5	101.0	Bushels	117
Corn	20.5	86.2	Bushels	320
Oats	32.0	48.1	Bushels	50
Barley	23.8	44.0	Bushels	85
Grain Sorghum	10.7	49.0	Bushels	358
Cotton	157.1	453.0	Pounds	188
Sugarbeets	11.9	19.3	Tons	62
Sugarcane	15.5	37.4	Tons	141
Tobacco	775.9	2011.0	Pounds	159
Peanuts	649.9	2565.0	Pounds	295
Soybeans	13.4	28.4	Bushels	112
Snap beans	27.9	37.0	Cwt	33
Potatoes	66.0	253.0	Cwt	283
Onions	159.0	306.0	Cwt	92
Tomatoes:				
(Fresh market)	61.0	166.0	Cwt	172
(Processing)	4.3	22.1	Tons	413
Hops	1202.0	1742.0	Pounds	45

A graph of average annual yields for each crop would have many ups and downs, influenced primarily by the weather; however, the trend has been steeply upward. Some crop yields are apparently beginning to plateau. Consumer demands require that we achieve equivalent or better gains in the next 45 years. Increased research on the biological processes of plants and plant pests is required to put genetically superior crops in the field and protect them against pests and environmental stresses.

Factors influencing the yield of a modern crop variety are complex. Fundamentally, yields per unit input of land, labor, and energy can be increased by breeding and crop management. The proper integration of genetic potential with insect and disease control, weed control, use of fertilizer and irrigation, timely and efficient cultivation and harvest, and other management activities are essential to continued yield increases. As crop production systems increase in complexity, genetic yield potential must keep pace. However, the genetic diversity must also be broad enough to avoid losses from pest outbreaks and to minimize the effects of annual weather fluctuations. The weakening of a single component may greatly depress overall yields, as illustrated by the corn blight situation in 1970.

Phase 7. Produce high-quality planting seed and distribute it to farmers.

This final phase of germplasm resources management has increasingly become a function of the commercial seed industry. The function of the seed trade is to supply farmers with an uninterrupted source of improved, high-quality planting seed. Some segments of the industry also support extensive breeding programs and thereby contribute to the objectives outlined under phases 5 and 6. However, the industry is not in a position to assume responsibility for many of the fundamental research objectives of germplasm management described in phases 1 through 4. On the contrary, the research efforts of industry have beer and are likely to continue to be concentrated in those areas of practical plant breeding designed to produce the maximum number of commercially acceptable varieties in a minimum amount of time. To provide answers to fundamental breeding questions, increased support of the public research institutions is essential.

The cooperation between the public institutions engaged in the genetic manipulation of plant germplasm and the private seed industry is unique to the United States. Over the years the two groups of organizations have arrived voluntarily at a logical division of labor that includes minimal duplication of effort. The complementary nature of the relationship has served American agriculture well. The need for this kind of cooperation is as great today as at any time in the past. Each crop improvement program of industry and the public agencies does not need all seven phases; the nation itself needs all phases. This program can be a model for the national sharing of the workload among State and Federal agencies and private industry.

III. RESEARCH PRIORITY FOR PLANT BREEDING

In a recent "white paper" entitled "Research Priorities in Plant Breeding," Sprague, Alexander, and Dudley emphasized that successful plant breeding feeds the world. Recently, planning reports and the popular press have suggested that proven plant breeding methodologies will be replaced by genetic engineering. The "white paper" states that:

1. Classical plant breeding has been successful.

2. The limits to crop improvement through classical plant breeding have not been attained.

3. The heritable variation necessary for long-term improvement exists in our crops.

4. Effective utilization of variation requires a plant breeding approach.

5. Genetic engineering is a potentially useful tool that must have concurrent use of plant breeding techniques if it is to be effectively applied.

The broad field of genetic engineering now receives a high priority ating. The field holds some promise and unquestionably deserves support. he high priority rating is questionable, however, if the research is to be chieved through neglect of those disciplines that continue to improve plant erformance and offer promise for the future. Even if new products are eveloped by genetic engineering techniques, the use of them will be accomlished through conventional crop improvement programs. Continuing progress n improving the performance of crops cannot reasonably be expected unless his relation is understood and implemented.

Budget justifications for plant breeding encounter difficulties. The lant breeding effort is shared by State, Federal, and private enterprise, nd the work is scattered geographically and fragmented by commodities. Budet proposals look too much like "shoring up" of old programs that has been iven the lowest of priorities recently. Plant breeding does not enjoy any rendword popularity, and component parts of the total system are often rated ut of context.

Since the term "genetic engineering" has been coined, claims have coninually been made that new techniques developed in the prokaryotes (bacteria, iruses)--for example, cell culture, protoplast fusion, and plasmid modificaion and transfer--hold great promise for both plant and animal improvement. hese claims have been accepted by some and accorded a higher priority in esearch funding than that given conventional methods of breeding.

Uncritical acceptance of the potential importance of the new "genetic ngineering" techniques, requires the denial of one or more of the following acts:

1. Efficiency of crop production is of short-term importance to American agriculture; the agricultural applications of genetic engineering are admittedly long range.

2. Plant breeding has made, and continues to make, genetic advances in crop productivity and quality.

3. Past successes in plant breeding have not exhausted genetic variability to the point that little progress can be anticipated in the future; much useful variability exists in domestic and exotic germplasm.

IV. CROP COMMITTEES

During recent decades, massive resources have been directed to support the improvement of the major food commodities worldwide. Support of a network of 10 international agricultural research institutes, most organized on a crop or animal commodity basis, has increased from about $15 million in 1972 to about $90 million in 1978. Concurrently, a number of foreign national agricultural research systems have been strengthened at an annual cost several times that invested in the international institutes; most of them also are organized on a commodity basis. Most receive substantial financial support from the United States, either directly through USAID or indirectly through the international banks. Most international agricultural research is organized around commodities; for the United States to be informed and influential about developments abroad, we should have strong commodity committees comprising authorities in plant breeding, plant pathology, entomology, and other relevant fields.

The United States should develop a cadre of national and international commodity experts in USDA and the State systems. Such individuals should have wide knowledge to keep the United States at the forefront of international efforts.

There should be a separate national committee for each crop or group of crops of significance to American agriculture. SEA, USDA could provide control leadership and support. In most cases the committee leader should be a plant breeder or geneticist of high national standing. The mandates of each committee should include:

1. Development of a strategic overview of progress in the United States with each commodity identifying strengths and weaknesses of the national scientific efforts on that species and recommending means of organizing activities that would benefit from national cooperative work. Particular attention should be given to plant breeding and genetics and to activities on disease and insect resistance and other means of pest control.
2. Development of an ever-improving understanding of foreign scientific developments on the crop in question identifying and describing implications for science and agriculture in the United States.
3. Providing periodic reports on national and international developments with the species, with statements of implications for the United States and recommendations for strengthening work, either in this country or in institutions abroad receiving major support from this country.

V. PERSONNEL REQUIREMENTS

Qualified scientists are needed to estimate the U.S. manpower requirements in germplasm biology. Current estimates of national need are lacking in the private and public sectors. An estimate of manpower requirements has been made by and for the USDA, but this estimate is for such broad categories as "soil scientists," "plant pathologists," and "agronomists." It does not delineate the proportion required within any group for germplasm biology.

The needs must be identified for the private, public, and possibly international sectors. Estimates should be compiled for the near future (5-10 years) and for the long term (more than 10 years). This documentation should include areas of germplasm biology that are of current critical importance (e.g., host-parasite biology, population biology, cytogenetics, evolution, breeding methodology) and of potential importance (e.g., cellular and subcellular biology of flowering plants, cell and tissue culture, viral transfer of genetic material).

Research program development in the United States accelerated immediately after World War II. Many of the scientists recruited at that time are now reaching retirement age. Many changes in personnel must take place during the next 10 years. The present time is therefore critical for reviewing manpower requirements and for reconsidering program priorities at all levels. In spite of the expansion of research during the past 30 years, the current output of qualified personnel may not be adequate to meet the needs of the near future. The number of training centers, particularly in plant genetics, has diminished, and the possibilities of extinction in certain areas of expertise are real.

VI. FUTURE OF NPGRB AND ITS REQUIREMENTS

The NPGRB should:

(1) Identify relevant research areas needing funding.

(2) Suggest how regulatory agencies responsible for detecting breakdowns in agricultural systems might more efficiently meet national needs (e.g., detection of potential disease epidemics in the United States and abroad).

(3) Help develop guidelines on the competitive grants program.

(4) Serve as a principal arm for the Secretary in studying germplasm resources and in recommending use of breeding

material, thereby helping to insure that appropriate measures are taken to avoid catastrophes caused by narrowing the germplasm base during the improvement of crop plants.

(5) Change its membership in a regular and systematic way in order to bring fresh ideas and new experience to the task.

To accomplish its purposes the NPGRB should be assured of an existence long enough to meet the objectives so urgently needed by the nation. The operations of the NPGRB would be greatly enhanced if it had the services of a fulltime, permanently assigned Executive Secretary with clerical staff and a budget sufficient for travel, publication costs, and occasional conferences or symposia.

STATEMENT OF CARY FOWLER, NATIONAL SHARECROPPERS FUND

I am Cary Fowler representing the National Sharecroppers Fund. Since 1937, we have worked with and tried to advance the best interests of the nation's sharecroppers, tenant farmers, migrant workers and small farmers. Since 1972, we have operated the Frank Porter Graham Demonstration Farm and Educational Center, named after a former U.S. Senator from North Carolina and beloved president of the University of North Carolina, who was one of the founders of the National Sharecroppers Fund. Prior to joining the staff of this organization, I was co-author of a book on agricultural policy and a consultant to the United Nation's Centre on Transnational Corporations.

I am pleased to have the opportunity to be here today and offer my thoughts to you on the subject of the proposed amendments to our Plant Variety Protection Act.

INTRODUCTION

In the year and a half since S. 23, an amendment to the Plant Variety Protection Act (PVPA) of 1979, was introduced into Congress, many questions have arisen about the effects of plant patenting on our agricultural system. These concerns have come from many quarters: from the United Nations, international crop breeding institutes, agencies of the state of California, National Academy of Sciences, farmer's organizations, environmental groups, university scientists, consumer groups, small seed companies, religious bodies, major daily newspapers, and from citizens across the country. The concerns raised have been left largely unanswered. I would like to examine with you the alleged benefits of this legislation and weigh them against the costs and risks involved.

I. THE RATIONALE GIVEN FOR PLANT PATENTING AND S. 23

Proponents of S. 23 rest their case on one central argument: that plant patenting encourages research and the development of more new varieties. The unquestioned assumptions are that 1. the new varieties thus developed are significant and noteworth and 2. the public is in need of more crop varieties of this sort.

In support of their contention that plant patenting laws encourage research, proponents cite a survey conducted by the National Council of Commerical Plant Breeders. The following figures show research as a percentage of total sales: 1960—2.9 percent; 1965—3.6 percent; 1969—4.4 percent; and 1976—5.3 percent.

These figures show a steady increase in research since 1960. They reveal that increases in research in the seed industry began long before the PVPA was passed in 1970. But more importantly, they reveal that yearly increses in research (percentage basis) were greater before PVPA than after passage of the Act in 1970.

Proponents also commonly cite increases in the number of new varieties of wheat and soybeans, contending that these increases are attributable to the PVPA. They state that "During the 17 years prior to the enactment of the legislation, only 50 new varieties of wheat came onto the market; whereas, during the seven years since passage of the Plant Variety Protection Act, 54 new wheat varieties have come onto the market." This statement is misleading in that it normally takes longer than seven years to develop a new variety of wheat. Thus many, if not most of the varieties released after 1970 were being worked on prior to passage of the PVPA in 1970 and would have been offered anyway.

Proponent also note the large increase in soybean varieties on the market. We suspect this increase is attributable more to the rise in demand for soybeans than to the PVPA. In the South, acreage devoted to soybeans has risen 684 percent in the last 30 years. This fact alone would be enough to insure a sizeable increase in soybean breeding.

We observe that proponents offer no comprehensive figures to support their assertion that this Act has led to more new varieties being offered the public. This a serious omission on the part of proponents, for it means that they offer no data to support their principal argument. Instead, as evidence we are offered isolated and questionable examples.

Finally we note that the National Academy of Sciences has characterized these new varieties not a major break-through, but as "fine-tuned adjustments" to mechanization and the needs of food processors, etc.

We submit that proponents have failed to prove their case.

II. GENETIC UNIFORMITY/ENFORCEMENT PROBLEMS

The most crucial concern raised by opponents has to do with the possible connection between plant patenting and the loss of genetic diversity.

In its classic 1972 book, *Genetic Vulnerability of Major Crops*, the National Academy of Sciences stated that our plant variety protection, or plant patenting laws, were "narrow(ing) the germ plasm base." More recently in their *Conservation of Germplasm Resources: An Imperative*, the Academy stated that "the introduction of the new cultivars produced in crop breeding programs for large-scale production is eliminating many of the folk varieties or land races. Tomatoes—a crop specifically cited by the Academy as suffering a loss of diversity due to the introduction of new cultivar—would become patenable if S. 23 were made law. Proponents argue that the chief benefit of the amendments is that they would further encourage the introduction of more new varieties. If this is true, it would further reduce genetic diversity in tomatoes and other crops.

More recently the U.S. Presidential Commission on World Hunger stated that genetic vulnerability in crops "has been given a big boost by plant patenting laws." Dr. Richard Levins, John Rock Professor of Population Science at Harvard University, Dr. Kenneth Dahlberg of Western Michigan State University, Dr. Donald Innis, chairman of the Department of Geography at the State University of New York, and Dr. Richard Frank, Associate Director of the Institute for Ecological Studies and Professor Emeritus at the University of North Dakota have all previously offered testimony linking plant patenting to the decline in genetic diversity. Dr. Timothy Weiskel, Andrew Mellon Fellow at Harvard University stated bluntly that those who believe the ominous trend towards genetic uniformity is unrelated to plant patenting laws are "dangerously misinformed."

The PVPA contributes to genetic uniformity and the loss of genetic diversity in three distinct ways:

1. It is widely acknowledged that traditional varieties of our major food crops are being rapidly displaced in those areas of the world known for their remarkable genetic diversity. These areas, known as "gene centers" are all located in developing countries. There seed companies promotes new varieties of seeds to farmers. (Note the statement above of the National Academy of Sciences on this subject.) New varieties replace traditional varieties which are seen as competition by multinational seed corporations. As the old varieties are replaced, they become extinct. This phenomenon is amply documented by numerous United Nations and academic studies. In its "Final Impact Statement" on S. 23, the USDA noted that the bill would serve to increase international trade in seeds. In the absence of any program to guarantee that displaced traditional varieties do not become extinct, we must conclude that plant patenting could be expected to increase the rate at which traditional varieties are replaced and driven extinct. The net impact of the legislation would be to decrease the genetic diversity of food crops. The dangers to agriculture inherent in this trend are real and great and have been noted by many scientific bodies.

Plant patenting is certainly not the only force behind this trend. It is, however, one of the forces.

2. Plant patenting would seem to encourage companies to drop traditional varieties (for which there is competition) from their catalogs and concentrate instead on offering only those varieties over which they have exclusive control through patents. In West Germany, only 5 percent of the varieties offered for sale are not patented. All cereal varieties in the United Kingdom are patented. In the U.S., no provisions are made for insuring that the traditional varieties thus deleted are preserved. Such provisions should be made.

3. For standardization and enforcement purposes, an added degree of genetic uniformity is demanded within each patented variety. Testifying against plant patenting proposals in 1968, then Secretary of Agriculture Orville Freeman called the proposals "scientifically and legally unsound" and explored in some depth the ultimate futility of attempting to encourage genetic uniformity for the purpose of enforcement. More recently Dr. Richard Levins of Harvard University has noted that "The production and maintenance of a well-defined variety should prove impossible." Moreover UPOV, the plant patenting promotional organization the government seeks to join, has itself admitted that there is "no commonly accepted precise definition" of the term, "plant variety." Given the fact that biological laws do not conform in this case to the necessary legal requirements, we would anticipate future enforcement problems as well as the added environmental risks associated with genetic uniformity.

The USDA has recognized that genetic diversity is "crucial to the survival of our food supply." They feel that the PVPA plays an important role in preserving germplasm by requiring that germplasm of each patented variety be placed in the National Seed Storage Laboratory in Fort Collins, Colorado. It is fine that the PVPA requires the germplasm of protected ("patented") varieties be preserved. But it is not the patented varieties offered in the seed catalogs that we should be primarily concerned about saving in our overcrowded seed banks. These varieties are the least threatened because they are in use. No one is saying that patenting laws will pose a danger to the patented varieties themselves.

Finally, it should be noted that if the PVPA succeeds in encouraging the development of more new varieties, it will not necessarily have succeeded, as proponents claim, in expanding "total genetic diversity." As plant scientists note, genetic diversity does not simply have to do with the number of varieties. Meaningful genetic diversity requires that there be significant genetic differences between the varieties. The testimony of Gary Nabhan to this subcommittee deals with this subject in some depth.

We do not believe that the impact of the PVPA on genetic diversity has been adequately examined by the USDA and other proponents. They have offered no studies which contradict the foregoing analyses. Repeated assurances that in their opinion, there is "no problem" are scarcely reassuring in light of the findings of numerous scientists and scientific organizations. This area is in desperate need of further study before this bill is acted upon.

III. EXCHANGE OF INFORMATION AND BREEDING MATERIALS

It is well known that most if not all major plant breeding institutes oppose plant patenting because of its restrictive effects on the exchange of scientific information and breeding materials. E.J. Wellhausen of the Rockefeller Foundation has stated that breeders at the prestigious International Corn and Wheat Improvement Centre (CIMMYT) "take a strong stand against it because it restricts the free exchange of genetic materials." He goes on to point out that "In a system of patents and royalties, CIMMYT and IRRI are restricted on the distribution of basic breeding materials and advanced promising lines. If all companies could have equal rights to increase and market CIMMYT materials they found desirable for normal seed profit, there would be no problem, but when patents and royalties are involved, it precludes other companies or the State from marketing a particular variety CIMMYT may release."

In a United Nation's Food an Agriculture Organization policy guideline paper dated February 28, 1980, the FAO states: "While the Convention [UPOV] may have been established to protect the rights of plant breeders, it has in fact contributed to an excessively monopolistic atmosphere in plant breeding in developed countries, which has had negative effects on the complex structure of international plant breeding. An important example of such negative effects recently encountered by FAO and the UN System has been the restriction of the free exchange of some categories of germ plasm." During the last year, the UN's FAO/UNDP has convened two meetings to work out problems arising in this area without notable success or resolution.

Secretary of Agriculture Orville Freeman testified in 1968 that plant patenting laws would "inevitably inhibit research by preventing the free interchange of information and genetic material among breeders."

The Agricultural Institute of Canada last year stated that "Plant breeders tend to keep confidential new germ plasm and discoveries. This tendency would be strengthened among plant breeders with the advent of breeders' rights [plant patenting]."

And according to Gary Nabhan, "since 1972, not a single private agribusiness breeder has published descriptions of breeding schemes or techniques for their new varieties in Hort Science's "Cultivar and Germplasm Releases" section, the most popular outlet for such information among university and government breeders."

Thus it appears that the stated purpose of the PVPA—to promote the development and introduction of new varieties—is thwarted by the PVPA itself. We believe that our laws should encourage the free flow of information and breeding materials and certainly should not adversely affect public breeding programs.

IV. SEED COMPANY CONSOLIDATION

In recent years some 50 once-independent seed companies have been acquired principally by large multinational drug and chemical firms—many active in areas like fertilizer and pesticide production which relate to the seed business. Nearly a dozen more acquisitions are now under consideration. A trade consultant's report (available for $25,000) describes the "acquirer's romance with the seed industry." These takeovers could reduce competition and ultimately lead to (1) higher seed prices, (2) a reduction in the number of regionally-adapted seeds, and (3) a reduction in innovation and research, which is generally associated with lessened competition. The takeovers include:

New owner and seed company

Anderson Clayton (ACCO)—Paymaster Farms, Tomco-Genetic Giant.
Cargill—Dorman Seeds, Kroeker Seeds, PAG.
Celanese—Cepril Inc., Joseph Harris Seed Co., Moran Seeds.
Central Soya—O's Gold Seed Co.
Ciba-Geigy—Funk Seeds Int'l., Louisiana Seed Co., Stewart Seeds.
DeKalb—Ramsey Seed.
FMC Corp.—Seed Research Assoc.
Garden Products—Gurney Seeds.
Grassland Resources—Taylor-Evans.
Hilleshoeg/Cardo—Int'l Forest Seeds Co.
Int'l Multifoods—Baird Inc., Lynk Bros.
ITT—Burpee.
Kent Food Co.—L. Teweles Seed Co.
Kleinwanzieberer Swatzucht AG—Coker's Pedigreed Seed.
NAPB (Olin and Royal Dutch Shell)—Agripro, Inc., Tekseed Hybrid.
Occidental Petroleum—Ring Around Products.
Pioneer Hi-bred—Lankhart, Lockett, Peterson, Arnold Thomas Seed Co.
Pfizer—Clemens Seed Farms, Jordan Wholesale Co., Trojan Seed Co., Warwick Seeds.
Purex—Advanced Seeds, Hulting Hybrids.
Rorer-Amchem—Jacques Seed Co.
Sandoz—National-NK, Northrup-King, Rogers Brothers.
Southwide, Inc.—Delta & Pine Land, Greenfield Seed.
Tate & Lyle—Berger & Plate.
Tejon Ranch Co.—Waterman-Loomis Co.
Union Carbide—Ferry-Morse, Keystone Seed Co.
Upjohn—Asgrow Seeds, Associated Seeds.

The USDA and the American Seed Trade Association's written response to this trend is identical, word for word: "If a seed company has been successful in its research and has protected varieties which are accepted by the consumer, then they are more attractive, not only for takeovers, but for their owners." Begrudgingly, the connection is made between the PVPA and seed company takeovers.

An official of the American Seed Trade Association responded defiantly: "Plant patent laws may make seed companies attractive for takeover by large corporations. So what!" We are told that tax laws and general business trends have more to do with the takeovers than the PVPA. This does not lessen our concern over the possible impact of the takeovers and we believe that a thorough study of this trend and its implications should be made before this bill advances. No such study has been made to date.

V. MARKET CONTROL

We are concerned that large companies better able to devote funds to research will be able to obtain market control through patents. Such a development would be detrimental to small seed companies and consumers. Such a development would far outweight any "protection" offered small seed companies by the PVPA.

As of March 1979, five companies and their subsidiaries held 30 percent of all patents granted. This is considerably higher than the incorrect figures often cited by the USDA and the House Agriculture Subcommittee on Department Investigations, Oversight and Research that six companies hold 17-19 percent of the patents.

The USDA claims that patents not issued to these corporations have gone to "smaller companies." This is misleading, for Cargill, Celanese, FMC, Ciba-Geigy, R. J. Reynolds, Rorer-Amchem, Occidental Petroleum, Unilever, Olin, and Royal Dutch Shell must be considered as "smaller" for the statement to be accurate. Among these "smaller" companies are the world's largest agribusiness company, the world's largest grain company, and the world's largest seed company among others.

More importantly, such figures underestimate the potential for market control. Rather than looking at aggregate figures, we should be examining the level of control within each crop. Examining the crops that have experienced the most patenting activity, we find significant levels of concentration:

As of December 1979 3 corporations hold 80 percent of patents on beans; 4 corporations hold 45 percent of patents on cotton; 4 corporations hold 60 percent of patents on lettuce; 4 corporations hold 62 percent of patents on peas; 4 corporations hold 48 percent of patents on soybeans; and 4 corporations hold 36 percent of patents on wheat.

Crops with less patenting activity show even higher levels of concentration. For example:

As of December 1979 4 corporations hold 69 percent of patents on barley; 2 corporations hold 100 percent of patents on cauliflower; 1 corporation holds 100 percent of patents on China Aster; 1 corporation holds 100 percent of patents on eggplant; 2 corporations holds 100 percent of patents on sweet peas; and 3 corporations hold 100 percent of patents on tobacco.

On occasion, proponents of plant patenting have claimed that the PVPA is responsible for the formation of several one and two person companies being formed. Our response is threefold:

1. We know of no study which would prove a link between the PVPA and the formation of these companies. Many of these companies have probably arisen due to market conditions such as the previously cited increase in soybean production.
2. No figures have ever been given to show that the total number of seed companies has been increased since passage of the PVPA. It is possible that while several new one and two person companies have appeared, even more have disappeared. Many have been bought and consolidated.
3. Where, we must ask, are these new one and two person companies coming from? Are breeders leaving the public sector to establish their own companies? If so, is this having an adverse effect on these programs? Are public breeders able to take the fruits of their publically-financed labors and jump to the private sector to patent varieties they worked on in the public programs?

VI. SEED PRICES

According to an unpublished report of the National Science Foundation (using USDA data), seed prices have risen faster than any other farm input cost since passage of the PVPA in 1970. The traditional relationship between seed prices and the Crop Price Index has been broken. This has led the International Federation of Agricultural Producers and the National Farmers' Unions' of both the U.S. and Canada to oppose plant patenting proposals formally.

Opponents are concerned that patents will encourage companies to engage in additional promotional campaigns for their patented varieties and that farmers and gardeners will end up paying for those costs. Once a patented variety is established as "superior" through effective and well-known marketing techniques, the price can be raised artificially. This practice is not uncommon in other businesses.

If patenting does encourage advertising, other problems might also arise. Farmers may be encouraged to buy seed inappropriate to their situation. Already there are reports from Africa that inappropriate European patented seeds have been marketed there. One expert noted that the seeds were "best known for being best known." Court cases have arisen in Europe and verdicts have been handed down over attempts by companies to use the patenting system to artificially raise prices.

While the link between the remarkable rise in seed prices and the PVPA and consolidation in the seed industry has not been conclusively established, there is enough evidence to warrant a close examination of these relationships. Rather than study or act on the problem, the USDA's response has been to advise that "Nobody must buy a variety which has a [patent] certificate." This is inadequate and unacceptable. That farmers are free to choose which seeds to buy is beside the point. The question is whether patenting does or will increase seed prices.

We are further concerned that with the advent of the marketing of seeds and agricultural chemicals as a "package deal" (a growing practice undoubtedly connected to takeovers of seed companies by petrochemical corporations), increases in seed prices could be disguised by the addition of chemicals. We are futher concerned that in the words of Dr. Richard Lewontin of Harvard University, "there is legitimate reason to suspect that chemical companies will link chemical research to plant varieties they are developing." This could lead to increased costs to farmers and gardeners.

VII. UPOV

In the "Final Impact Statement" on this legislation, the USDA stated that passage of this amendment would facilitate U.S. entry into UPOV (International Union for the Protection of New Varieties of Plants), a European-based organization that promotes and coordinates plant patenting laws worldwide.

The United Nations' Food and Agriculture Organization has spoken out strongly against UPOV. Portions of the February 28, 1980, policy memorandum are worth quoting at length:

"While UPOV may promote progress in plant breeding in certain cases, and has no direct effect on plant breeding in developing countries other than its already recognized tendency to encourage private sector activities at the cost of a corresponding reduction in the public sector, there is a possibility that it can indirectly exert a negative influence on the development of plant breeding in the world as a whole, and be detrimental for developing countries in particular.

"In fact, the growing concentration of plant breeding in the private sector has already demonstrated some negative effects. Among these are to be noted, for example, the increased cost of development programmes linked to increased cost of seed and related inputs, the use of marketing techniques inappropriate in developing countries, which have led to grossly unbalanced agricultural inputs, and the not infrequent cultivation of high-return plantation crops on top-grade food-producing agricultural land owned by multi-national companies and intended for foreign markets.

"Furthermore, since the germplasm of most of the world's important crops originates in developing countries, while most plant breeding, particularly sophisticated private sector production of new varieties, is conducted in developed countries, in an increasing number of cases developing countries have been required to pay royalties for varieties, the germplasm of which originated within their borders.

"Finally, it may be noted that the commercialistation (sic) and the subsequent commercial competitiveness resulting from the system of plant breeding encouraged by UPOV has led to intensive breeding of new varieties on a limited genetic base, resulting on several occasions in widespread disease epidemics.

". . . While the Convention [UPOV] may have been established to protect the rights of plant breeders, it has in fact contributed to an excessively monopolistic atmosphere in plant breeding in developed countries which has had negative effects on the complex structure of international plant breeding. An important example of such negative effects recently encountered by FAO and the UN System has been the restriction of the free exchange of some categories of germplasm."

Similar statements to the UN position quoted above regarding the effects of plant patenting in general on developing countries have been made by a number of recognized plant breeders including Dr. Norman Borlaug, Nobel Prize winning director of CIMMYT and Dr. Brady, director of IRRI in the Philippines, who called the laws "very undesirable."

U.S. entry into UPOV will cost the American public some $100,000, yet the public has never been offered an explanation of why the U.S. should join or what benefits we could expect to derive. There are strong suspicions that the benefits to be derived will flow to a handful of multinational corporations who are attempting to gain entry into foreign markets.

U.S. entry into UPOV will likewise contribute to the "bandwagon" effect that UPOV is trying to create in developing countries. We have already discussed the impact of seed industry activities in developing countries. A more powerful UPOV would exacerbate these problems.

We are opposed to U.S. entry into UPOV and view negatively any legislation that will facilitate such a move.

VIII. MORAL AND ETHICAL QUESTIONS

After a series of some 400 meetings on land issues, bishops of the Catholic Church representing 43 dioceses of 12 midwestern states issued the following statement:

". . . stewardship of land and life itself are both symbolically and naturally joined in the life-generating capacity of the seed. We must preserve for ourselves and for future generations the genetic variety of plants necessary to protect humanity from the hazards of inbreeding. We note with concern that inbreeding has become a major practice in our present agricultural system as greater yields and profits have been pursued. We also are disturbed by the acquisition of seed companies and patents by multinational corporations. *The control of seeds, because it implies also the control of food production and indeed of life itself, should not be appropriated to itself by any company or nation. We therefore urge a careful review of present and pending seed patent legislation.*" (Our emphasis.)

Similar statements have also been issued by officials of other major religious denominations including the Presbyterian Church, USA, and the American Baptist Church.

In testifying in the House against amendments to the PVPA, Dr. Kenneth Dahlberg of Western Michigan State University commented that 90 percent of all plant breeding has been done by nature itself, 9.9 percent by subsistence farmers and our Stone Age ancestors over hundreds of generations, and 0.1 percent by the patent holder. All of our major crops originated in developing countries and are maintained by genetic material from those areas. Where does the "credit" go? Who should reap the ultimate benefits?

Because the rationale that is used to patent plants could easily be used to support legislation enabling animals to be patented (a development UPOV would not oppose and may in fact support), we feel that the time has come to examine some of the obvious implications. Ethical and moral questions about this legislation—or any other—are not irrelevant. It would be refreshing were our government to seek input from appropriate individuals and organizations on this issue.

The National Sharecroppers Fund stands in support of plant breeding efforts in this country. We do not oppose plant breeders being "rewarded" for their unique contributions. However, we see no reason for that reward to come in the form of exclusive rights or a monopoly over the variety. Grants, tax incentives, and other benefits could be devised to protect the interests of the plant breeder while protecting the interests of society and the integrity of the environment. These avenues have been left unexplored. As we have seen, the "protection" offered by patents has served mainly large corporations. For the truly small breeder—the individual—the filing costs and the possibility of legal challenges to the patent may be so prohibitive as to negate any incentive to breeding that might be created by the PVPA.

With the market share of large seed companies increasing, it is becoming easier and easier for them to recoup their investment in the marketplace by virtue of their position.

IX. CONCLUSION AND RECOMMENDATIONS

The National Sharecroppers Fund wishes to record its opposition to S. 23. We do not believe S. 23 is a trifling, innocuous bill as it has been portrayed by some. Nor do we feel that the few claims that have been made about the benefits of the bill have been adequately documented. We and many others believe that the legislation will have a negative impact on society and the environment.

Since its introduction, S. 23 has been surrounded by controversy. It is time that this controversy be put behind us. This can be done only if thorough, exhaustive, impartial studies are undertaken addressing the concerns raised by scientists, scientific associations, the United Nations, state governments, farm, environmental, consumer and church groups.

Such studies should also examine the broader, and ultimately more important issue of genetic conservation of our food crops. This subject has long been neglected. Congress should soon hold oversight hearings on this relatively unknown crisis and the government programs which address it.

The PVPA was made law in 1970. For ten years we have lived without S. 23. We need not rush to pass this bill before all questions are answered. There is ample time for careful consideration and deliberation.

[From U.S. Senate, Judiciary Subcommittee on Patents, Trademarks, and Copyrights, Hearings on Patent Law Revision, Part 2, 90th Cong., 2d Sess., January-February 1968]

DEPARTMENT OF AGRICULTURE,
Washington, D.C., February 29, 1968.

Hon. JOHN L. MCCLELLAN,
Chairman, Subcommittee on Patents, Trademarks and Copyrights, Committee on the Judiciary, U.S. Senate, Washington, D.C.

DEAR SENATOR MCCLELLAN: This is in reply to your request of January 29, 1968, for a report on Amendment No. 511 to Sections 161 and 163 of S. 1042, a bill "For the general revision of the Patent Laws, title 35 of the United States Code, and for other purposes."

This Department is not in favor of the proposed amendment.

Sections 161 and 163 of S. 1042 relate to plant patents and are identical with the similarly-numbered sections of present Title 35 of the United States Code.

To the extent pertinent, the subject sections read as follows:

"§ 161. Patents for plants

"(a) Whoever invents or discovers and asexually reproduces any distinct and new variety of plant including cultivated sports, mutants, hybrids, and newly found seedlings, other than a tuber propagated plant or a plant found in an uncultivated state, may obtain a patent therefor, subject to the conditions and requirements of this title."

* * * * * * *

"§ 163. Grant

"In the case of a plant patent the grant shall be of the right to exclude others from asexually reproducing the plant or selling or using the plant so reproduced."

The proposed amendment would insert the words—*or sexually*—after the word "asexually" for the purpose of enlarging the class of patentable plants. Thus, where present 35 U.S.C. 161 and Section 161 of S. 1042 are limited to the protection of asexually-produced plant (e.g., plants which reproduce vegetatively, by grafting, or the like), the proposed amendment would include plants propagated from seed.

The Department of Agriculture objects to the amendment on two broad grounds: (1) It would threaten the continued existence of its long-standing programs for developing and introducing new varieties of seeds; (2) It is scientifically and legally unsound.

These two grounds are discussed separately below:

(1) The Department of Agriculture, either alone or in cooperation with the State Agriculture Experiment Stations and with private breeders, has, for many years, been engaged in a program of developing and introducing new and better seed varieties for the purpose of crop improvement. Such a program requires extensive periods of experimental planting and selective breeding to introduce desirable characteristics and eliminate undesirable ones. In this program, breeding lines that show considerable promise are sent to many locations for testing and evaluation. At harvest time, research personnel, seed producers, and farmers often inspect and pass preliminary judgments on the suitability of the selected seedlings as commercial types. When a new seedling is considered worthy of naming and introducing as a new variety, an official notice of release signed by the Department and the cooperators is issued. Seed producers or nurserymen are then notified and they are free to grow or propagate these new varieties for sale to the public.

The Department of Agriculture is at present bringing in from other countries new germ plasm in foreign varieties and the wild relatives of many of our crop plants. These new plants serve as sources of insect- or disease-resistance, hardiness, or other valuable characteristics for breeding and improvement of our present day varieties. A few, after growing here under cultivation are introduced directly as crop plants or ornamentals, and are made available to nurserymen. This Department does not grow and sell seed or other propagating material to seed producers or growers. Foundation stocks are furnished without charge to all bona-fide producers who desire them. A substantial part of seed producers' business in this country consists of varieties developed by this Department and other public agencies.

The notable success of this program in developing and introducing for example, new disease-resistant and more abundantly-producing varieties can be attributed in large measure to the free interchange of information, experimental plants, and germ plasm among research workers without the fear of misappropriation and misuse of any of this material. If seeds and seed-producing plants had originally been included within the scope of the plant patent statutes, a free and uninhibited communication among breeders, both public and private, would not have been possible. Where we now have exchange of data, open discussion, and exchange of experimental plants, the possibility of obtaining a patent would have been resulted in secrecy, with its consequent duplication of effort and greater expense in developing new varieties. It is safe to say that the high quality and abundant harvests of our seed-produced crops would not have reached their present proportions, but for the possibility of cooperation with the absence of patents on this category of plant engendered.

Should S. 1042 be amended to permit patenting of plants produced by seeds, it is inevitable that progress in the development of new varieties would be retarded. Restrictions on distribution would necessarily have to be imposed in order to protect the public interest and rights of plant materials under test. Without expensive and impracticable safeguards, superior patentable seedings might well escape from Federal or State plantings, and without authority be patented by others.

It has been the policy of the Department of Agriculture, since the enactment of the present Plant Patent Act, not to apply for public service patents on new varieties developed under its research programs. If S. 1042 were to be amended as proposed, it would become necessary for the Department to abandon this policy and apply for patents to protect the public interest, as it does on inventions arising out of its other research programs, this would further delay and restrict the free interchange of information and germ plasm. Those harmed most would be the small breeders and growers whose continued existence is so dependent on the cooperation and assistance from the Federal and State agencies.

(2) Our second ground of objection to the proposed amendment stems from the fundamental differences between vegetative or asexual reproduction of plants and the reproduction of plants by seed. It is also because of these differences that patenting can be a satisfactory medium only for the protection of asexually reproduced plants.

One of the basic, almost axiomatic, prerequisites for patenting, after an invention has been made, is that the invention be capable of identification and distinction. This prerequisite obtains, not only at the time the invention is made, but for the life of any patent granted on it. If the patent is to serve the purpose for which it was conceived by the framers of the Constitution, the temporary legal monopoly it grants must be capable of precise definition and delineation. It is a scientific fact that asexual reproduction is genetically absolute and results in an exact replica of the original. Except for occasional mutations, which can be readily eliminated, an asexually grown plant will reproduce true to type and be reasonably capable of identification for the purpose of determining patent infringement. Such is not the case with seeds.

Just as asexual reproduction is genetically absolute, great difficulty is encountered in keeping a seed-propagated variety true to its original characteristics, performance, and uniformity. For example, it is difficult to control a variety's inherent tendency to vary and to change as the result of natural selection. The effects of variability are difficult enough to control in relatively stable lines of self-pollinated species; control is especially difficult in the less stable cross-pollinated lines. As numbers of plants increase in succeeding generations after repeated shuffling of countless genes, characteristics emerge which did not have the statistical opportunity to appear earlier. Such off-type plants will also arise by mutation and perpetuate their characteristics by seeds.

In addition to the just described sources of variation, deviations from type result from changes in environment. Cabbage and tobacco are notable, but by no means exclusive, examples.

It must be remembered that the detailed features of a plant are the result of its heredity (its genes) and its environment. Although some varieties are less variable than others, no seed-propagated stock can be absolutely uniform in its hereditary makeup. Each different environment tends to increase variability of appearance or behavior; but there is no way in which the extent and direction of this variability can either be determined or predicted. There is almost unanimous agreement in the scientific community that there is no such thing as, and that there probably never will be such a thing as, an absolutely uniform and genetically stable variety that will behave identically regardless of the place where it is grown.

With the foregoing in mind, it becomes necessary to examine the impact of the inherent variability of seed-produced plants on the question of patentability.

Section 162 of S. 1042 (as does Section 162 of present Title 35) states that "No plant patent shall be declared invalid for noncompliance with section 112 of this title if the description is as complete as is reasonably possible." This language represents a relaxation of the strict requirements of Section 112 that (1) a patent specification "shall contain a written description of the invention. . . . in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains. . . . to make and use" the invention and that (2) the specification "shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor regards as his invention." In other words, Section 162 resulted from the realistic acceptance by its authors of the fact that living plants of any kind could not be described and defined with the same precision as a machine, a composition of matter, or a process. What Section 162, therefore, permits is the description of a new variety of plant in terms of its morphology, agronomic performance, disease and insect resistance, and quality characteristics, and declares that a patent granted on a plant shall not be held invalid because the same precise, definitive language could not be used as in the description of an invention relating, for example, to a machine.

Although it is a simple matter for a statute to set forth guidelines or criteria for validity, a patent is of no value unless its owner is able to enforce it. That is, although the owner can come into court with a patent which, in the case of a plant patent, the statute declares is conclusively presumed to be valid, the court must still be able to compare the plant of the patent with the specimen accused of infringing. Unless the court can determine that an accused plant does in fact infringe and then either enjoin its further production or grant damages, the patent can be used for no other purpose than to harass and frighten off would-be competition.

When we speak of determining the existence "in fact" of infringement, we mean only the relative ease with which such a determination can be made. The great number of appellate reversals in ordinary patent infringement suits attests to the fact that, even when a mechanical or chemical invention can be defined with relative precision as to structure or composition, patent owners, accused infringers, expert witnesses, and the courts do not find themselves in automatic agreement on the issues of identity or equivalence. Because there are few universal guidelines to determine what constitutes a verietal difference, and because the criteria can vary from one species to another, it is difficult, if not frequently impossible, to render any conclusive, or even reasonable, opinion that any given asexually-reproduced plant is, in fact, a new variety.

On the basis of the previously discussed inherent variability of seed-propagated plants, it is obvious that it would not only be almost impossible, in the case of such plants, for the Department to advise the Patent Office in accordance with Section

164 of S. 1042, but that it would be even more difficult for a court to decide an infringement suit. To prove infringement, the owner of a patent on a seed-propagated plant would at least have to establish a prima facie identity between the patented and accused plants.

Although asexually-propagated plants remain genetically stable and do not change with time, we have already explained how this is inherently not possible when propagation proceeds via the sexual route, that is, by seed. Besides the previous illustrations of variability in cabbage and tobacco, many varieties of crop plants exhibit a change in genetic composition from year to year, so that a variety, in a few years, would no longer even fit the description on the basis of which it was patented. This is particularly true of cross-pollinated crops, such as alfalfa and the forage grasses, and of partially cross-pollinated crops, such as cotton, or where seed is produced in an area different from the area of adaptation.

The above circumstances make it virtually impossible to establish a prima facie identity in an infringement suit; and it is extremely doubtful that any scientist would risk his standing in the professional community by attempting to give expert testimony in favor of a plaintiff that an accused plant infringes.

Another problem that suggests itself is how to establish and describe a permissible range of variability within a variety, particularly for cross-pollinated or multiline self-pollinated crops, beyond which a change in variety will be considered to occur. A corollary problem also arises from the practice of improving varieties by selection within a given variety and breeding to emphasize a particular desired characteristic. At what point would infringement cease and a new variety be created? Would such an improved plant be patentably distinct from the parent, or would it be subject to rejection on the grounds of double patenting?

Because of the virtual impossibility of enforcing a patent on a seed-produced plant, the granting of patents in this area would become little more than an act of registration and defeat the very purpose for which the patent system was established.

A final aspect of the difficulty in enforcing a patent on a seed-produced plant is the necessity of policing the entire United States market. A machine or a chemical composition can readily be detected and tentatively identified as an infringement and traced to its source. How would a patent owner prevent a farmer from using part of his crop for further seeding or from selling a portion to his neighbor for such purpose? Because the terms of Section 163 of S. 1042 would protect only the mature plant grown from seed, but not the seed itself, the patentee would have to proceed against every innocent private grocer or supermarket owner in whose store an infringing head of cabbage was found. The patentee would also have to proceed against every homeowner who planted a flower garden from seed produced by an infringing grower, regardless of how remote the two were.

An aspect of the proposed amendment which appears to have been overlooked in the public discussion of the subject is the effect of reading Section 161 in the context of S. 1042 in its entirety. One of the basic changes which would be made in our patent laws if S. 1042 is enacted will be the granting of a patent to the first inventor who filed a patent application, rather than to the first inventor, as under the present law. S. 1042 would also eliminate the present interference practice by which priority of inventorship between two applicants is determined. In place of the latter practice, there would be substituted a publication of the pending application, and the public would be given the opportunity to present evidence to the Patent Office why a patent should not be granted. Because of the inherent difficulty of maintaining effective security around experimental plots of ground, it is not beyond probability that theft of new, but unreleased, varieties of seed would be added to the already notorious industrial espionage practices. Just as it would be impossible for any court to render a decision in an infringement action, it would be equally, if not actually more, difficult for the Patent Office to decide the merits of an opposition to granting of a patent on a seed-produced plant. Furthermore, because of the pressure on the breeder to file a patent application before his competitor does so, it is inevitable that premature application will be made for patents in many instances with the result that patents may be granted on insufficiently tested and, perhaps, improperly described varieties.

To summarize the foregoing discussion, we wish to state that it is our opinion that the proposed amendment would render administration of the plant patent statutes unworkable; it would introduce an impenetrable confusion into this aspect of the patent law; and it would inevitably inhibit research by preventing the free interchange of information and genetic material among breeders.

The Bureau of the Budget advises that there is no objection to the presentation of this report from the standpoint of the Administration's policy.

Sincerely yours,

ORVILLE L. FREEMAN.

STATEMENT OF DR. BILLY E. CALDWELL, HEAD, CROP SCIENCE DEPARTMENT, NORTH CAROLINA STATE UNIVERSITY, RALEIGH, N.C., AND PRESIDENT, CROP SCIENCE SOCIETY OF AMERICA

Mr. Chairman, Members, and Staff. My name is Billy Caldwell of Raleigh, North Carolina. I am Head of the Crop Science Department, North Carolina State University, and President of the Corp Science Society of America. In my role as Department Head, I coordinate research, extension, and teaching programs relating to plant breeding and genetics, crop production, plant physiology and weed science. The Crop Science Society is a professional society of over 4,000 members in the disciplines of plant breeding and genetics, crop production, crop physiology, turf management and seed production. My training and individual research has been in the area of soybean breeding and genetics. I have also conducted research on nitrogen fixation with special emphasis on host genetics of the nitrogen fixing process. I have participated in a number of plant breeding conferences and contributed to the National Academy of Science publication on "Genetic Vulnerability." I edited the Monograph on Soybeans: Improvement, Production and Uses, and chaired the World Soybean Research Conference II.

I am pleased to have the opportunity to appear before this committee in support of the Plant Variety Protection (PVP) Act and the proposed amendments to the Act (S23 and S1580). The Act has benefited the grower and consumer through improved varieties that have been quality; are more productive; and contain resistance to an ever increasing number of pests that attack our crops. The need for the future will be even greater as new races or strains of pests evolve, and the demand for food and fiber increases. Resistant varieties will continue to be a major defense against pests, and are a major component for the net Integrated Pest Management (IPM) strategies. A key point to remember is that plant breeding is our only means of increasing the yield potential of varieties.

The users of advanced technology, such as new varieties, often fail to recognize that unlocking nature's biological secrets becomes progressively more difficult. Plant breeders do not exploit, they invest years—five to ten years for a variety. Through the PVP Act a plant breeder can protect his product, and reap the rewards of his efforts. This is true regardless of how or where he is employed. However, the new genetic combination is not protected. Other breeders can use protected varieties as a breeding stock and new unique combinations of one breeder can be combined to produce even better combinations. Therefore, nothing is "locked up," only the immediate product (the variety) is protected. The genetic potential is available to the innovative plant breeder. Professional competitiveness in genetic manipulation and the natural screening process of the marketplace insure continued progress. Breeders that develop "me too" varieties will not survive.

The concept of replacing "traditional" varieties with more vulnerable varieties is without scientific or logical basis. Most of our major crop plants were introduced into the U.S.—some that were adapted could be used while others were not adapted and were either discarded or modified by selection. There was also a period of time before natural or introduced pests became a problem, and these early varieties performed satisfactorily. Then the battle began! Pest populations changed, new production practices evolved, and U.S. production expanded into new areas—all requiring new varieties. Today the battle continues in a much more complex and sophisticated way. Simple selection has given way to complex breeding methods requiring many parents, populations, thousands of plots, and often winter nurseries. Thus the plant breeder is constantly searching for new germplasm and reevaluating old varieties in search of traits that will provide the needed variability.

Genetic uniformity did not arise as a result of Plant Variety Protection. It arose, in part, due to the lack of breeders and geneticists available to exploit the available germplasm, due to the lack of germplasm, and requirements of the market. Plant Variety Protection and the profit incentive are now providing manpower that cannot be provided by public agencies, and with this increased emphasis a greater effort is being made to obtain additional material. Since the passage of the Act some of the needed plant breeders, geneticists and other researchers have been added. Using 1960 as a base, private research has increased more than seven times and research investment as a percentage of total sales has increased from about 3.0 percent to over 5.0 percent. This occurred at a time when public dollars discounted for inflation had not increased. Thus genetic diversity would be expected to increase.

The provisions of the Plant Variety Protection Act, and the total scienfitic effort needed to meet the challenge of the future, encourage mutual interdependence between plant breeders of private industry and plant breeders and geneticicts of public agencies. Joint work conferences are held to encourage effective working relationships between public and private researchers in variety development. Scientists from other disciplines often participate. At these conferences, information on the latest techniques, current findings, and the priorities and goals of the future are discussed. This relationship is vital to both groups. New private and public varieties are evaluated by the State Official Variety Test programs to provide the grower a performance evaluation in comparision with currently grown varieties. Germplasm and plant introductions from working collections are made available from USDA-SEA-AR collections and from public programs for use by both public and private breeders. Normally a public notice of the release of improved germplasm is made to provide recognition for the scientists and equal access to all. This material is not of value as a variety, but normally contains traits such as multiple pest resistance or improved quality which, if incorporated into high yielding varieties, would contribute to the income of the grower and lower costs of food to the consumer. Another factor which enhances the cooperation between public and private plant bleeding is personal relationships among the breeders. A strong public plant breeding program in the universities is a necessity and must be retained in order to train plant breeders for employment by both public and private agencies. The bonds developed during a graduate program in the university leads to continued mutual trust and respect. Thus, information is often exchanged without a fear of loss of propriety information. Therefore, the cooperation between public and private plant breeders leads *to increased scientific input, increased genetic diversity* and *better varieties.*

To illustrate my point I would like to use the crop with which I am most familiar, and one that has been enhanced by PVP. During the past 100 years, soybean breeding has moved from an art to a science. The original breeders were basically agronomists. Their goal was to seek ways of making soybeans an important commodity. Soybeans were first grown in Pennsylvania, and the records indicate that this plant was not adapted to the United States and would not contribute to United States agriculture. However, this was not accepted by Mr. W. J. Morse. He obtained other material from China and Korea and grew this material at the Arlington Farm—the current site of the Pentagon. Based on his results, he encouraged others to try growing this crop to be used primarily as a hay or as a "green manure." These early types were viney with black seed. Later more erect, yellow seeded types were observed. Selections from this material gave us our first oil type varieties, and during World War II, the demand for vegetable oil was the impetus needed to establish soybeans as a major crop. This demand stimulated interest in the development of varieties adapted to a range of environments. The art became a science; and an understanding of genetics, maturity, lodging, disease resistance, nematode resistance, and oil quality was required. Breeding methodology for efficient selection had to be developed and discipline scientists in pathology, physiology, soils and chemistry were enlisted to assist the breeders and agronomists. The challenge was met and varieties were developed that were adapted to environments from Minnesota to Florida. Old varieties and many of the original introductions were retained and continue to serve as a valuable source of resistance to new races and strains of new and old soybean pests.

The PVP Act has provided an opportunity for the soybean breeding effort to expand. The addition of about 35 private plant breeders has provided flexibility to use public resources to pursue in-depth studies on genetics and physiology of the plant and to investigate the pests attacking soybeans. Currently, the number of soybean breeders in proportion to the total number of soybean scientists is less than in 1967 when almost all the research was supported by USDA and universities. Public agencies are and will continue to develop varieties and germplasm, but an increased effort is aimed at improving the genetic potential, new sources of pest resistance, improved quality and to allow emphasis on germplasm maintanance. For example, plant populations are being developed that include germplasm (old varieties and introductions) that will broaden the component that contributes to the reduced shelf life of soybean oil, and to improving the protein quality thus improving the nutritional value of soybeans. The germplasm base increases due to increased emphasis in the public agencies as well as the increased genetic diversity that arises as a part of each breeding program. Thus, the benefit of the PVP Act is to enhance the total research effort in soybean production as well as to provide for the protection of the newly developed varieties. Today's soybean grower has a choice of varieties, both public and private, with attributes that will fit all the zones of adaptation and resistance to many pests. This is compared to only two or three varieties 20 years ago.

A relationship that is vital to the issue of genetic diversity and germplasm exploitation in the United States and other countries is our relationship with international centers and foreign research institutes. Most international centers have as a part of their charter the collection and maintenance of germplasm important to that region or to the mission of the center. In many cases their efforts are in concert with United States domestic and other international efforts.

For example, in North Carolina we have been concerned with obtaining and utilizing introductions of peanut germplasm from the center of genetic diversity in South America. We have been supported in these efforts by the International Plant Board for Germplasm Resources, and by the International Center for Research for Semi-Arid Tropics (ICRISAT) located in India. A part of ICRISAT's responsibility is groundnuts (peanuts). Our joint effort is to assemble and preserve as much material as possible of the species for use now and as a resource for the future. We are also developing complementary programs designed to utilize the germplasm. Similar examples could be given for other centers and institutes. Another role of the international centers is to train plant breeders and to assist the developing countries in obtaining and utilizing improved germplasm. The key factor in this scheme is the planned joint effort to collect and use germplasm while assisting farmers in the developed and developing countries. We are therefore not dependent on random discovery of germplasm in the developing countries and recognize the need of these countries for better varieties.

In summary, the questions raised by opponents of the legislation which you are considering have not dealt with the specific issues of the amendments to the Plant Variety Protection Act but with issues of genetic diversity and breeders' rights. Mr. Chairman, in my presentation I have attempted to respond to some of these concerns and to show:

1. That the Plant Variety Protection Act protects the product and does not lock-up genetic information (nature), nor does it limit creativity;
2. That because of the close relationships and mutual interdependence between public and private plant breeders, the Act leads to increased plant breeding efforts and thus frees public resources for research in other disciplines;
3. That the total impact leads to an increase in genetic diversity, improved germplasm, and better varieties; and
4. That the relationship between United States public agencies, international centers, and foreign research institutes leads to an increased emphasis on germplasm collection and maintenance, and this will benefit United States consumers and consumers in the developing countries.

I encourage the committee to take favorable action on this legislation so that we may continue to improve varieties of all crops. The current legislation provides the needed protection since the vegetable crops excluded from the previous legislation are included. Without the Plant Variety Protection Act a major funding increase would be required for public agencies to replace the current private investments if we are to meet our food and fiber demand for the future. If additional public funds are available for genetics and plant breeding, they are needed in germplasm exploration, the development of new breeding technology, and basic genetic studies.

Thank you for the opportunity to share these thoughts.

Statement of Charles F. Lewis, U.S. Department of Agriculture (Retired)

My name is Charles F. Lewis. I retired from the U.S. Department of Agriculture in June 1979. I was in the Science and Education Administration, where I served as the National Program Staff Scientist responsible for plant genetics and breeding. I was involved in planning the U.S. National Plant Germplasm System and was leader of a special project on genetic vulnerability. I participated in the writing of two National Academy of Sciences reports, "Genetic Vulnerability of Major Crops" and "Conservation of Germplasm Resources—An Imperative." I was Executive Secretary of the National Plant Genetic Resources Board, appointed by Secretary Butz and continued by Secretary Bergland. Mr. Chairman, my testimony will support the passage of the proposed amendments and defend the original plant variety protection legislation.

In earlier testimony in the House of Representatives, witnesses who opposed passage of the proposed amendments to the Plant Variety Protection Act, Public Law 577, attacked the original legislation much more than the amendments as such. It would not have been credible to contend that the removal of the exemption to six vegetables would be of much importance.

The Plant Variety Protection Act, Public Law 577, was passed as a matter of justice and equity. Plant breeders, like others who invent or create useful products by their intellectual efforts, deserve a reward for their work. Plant breeding is expensive, if conducted properly. It requires land, buildings, seed processing equipment, storage space, and some highly trained employees. Moreover, plant breeding is slow. It may take 15–20 years from the first cross-pollination to the release of a variety for commercial production. Plant breeding requires knowledge of genetics, cytology, physiology, pathology, and entomology, as well as chemistry of product quality. Modern breeding requires the setting of desirable objectives, assembling genetic stocks, and following sound breeding procedures to reach these objectives. It requires a thorough and scientific evaluation of the material before it is offered for sale.

Breeders who invest time, money, and intellectual skills in developing improved products ought to have more rights to them than those who invest nothing. It is obvious that unless the breeders have a good chance of recovering their investments, they will cease to make the efforts, and agriculture will suffer. It makes no sense to deny this basic right to the breeders of six vegetable species, while extending it to the breeders of other crops.

Opponents of these amendments in earlier testimony implied that the Plant Variety Protection Act has had an adverse effect on genetic vulnerability of crops and on the diversity of crop germplasm. Genetic vulnerability comes about by having large acreages planted to a few varieties, and genetic diversity is reduced by the replacement of old land races or traditional varieties by modern, improved ones. These two concerns, genetic vulnerability and germplasm conservation, have been the subject of two National Academy of Sciences reports and of considerable activity by the U.S. Department of Agriculture, the State Agriculture Experiment Stations, and the seed industry. Trends in agriculture that led to these concerns began long before the Plant Variety Protection Act was passed. They are not the results of that legislation. They are consequences of the discovery of the Mendelian laws of heredity factors, and the development of plant breeding principles and practices. Any fair appraisal of the science of plant genetics and breeding must conclude that it has been of tremendous benefit in this country and around the world. The contribution of genetic improvement to higher yields, improved product quality, and resistance to pests and environmental stresses is well documented. Opponents of plant variety protection, unwittingly, I hope, seem to be arguing that ignorance of genetics and breeding is preferable to knowledge and that no effort to improve our agricultural productivity through genetics is preferable to vigorous efforts. My main point here is that opponents of the legislation attribute to plant variety protection results which are clearly due to other causes.

How to cope with genetic vulnerability and conservation of plant genetic resources is, I think, expressed best in the two National Academy of Sciences reports and in the report of the National Plant Genetic Resources Board to the Secretary of Agriculture, entitled "Plant Genetic Resources—Conservation and Use."

The latter report stresses that the best defense against genetic vulnerability is to have active genetic and plant breeding programs involving federal, state, and industry breeders in cooperative programs. The genetic diversity we need must be in back-up material in our breeding programs and in genetic resources conservation centers. The corn leaf blight epidemic of 1970 was quickly solved because breeders had resistant material in their programs, and they had the ability to propagate rapidly the seed supply of resistant material. Contrast that success with the failure to curb the current Dutch elm disease, where there is no breeding program. No way exists to reduce genetic vulnerability to zero. Genetic diversity among and within varieties planted, in my opinion, is not the best approach to this problem. Farmers in the United States and abroad are not willing, and should not be expected, to plant inferior seeds and make a personal sacrifice in low productivity as a contribution toward preserving diverse germplasm and preventing an unpredictable and rare event. The best place to have genetic diversity is in the national and international germplasm programs and in the breeding programs of all who engage in developing varieties.

The conservation of plant genetic resources is accomplished in four ways: (1) Most are maintained in nature, according to the "survival of the fittest" principle. These are most noncultivated plants, including wild relatives of the cultivated forms. (2) Folk varieties are plants cultivated generally by small farmers in lesser developed countries where modern, professionally bred varieties are not used extensively. (3) Collections are assembled by private corporations, public research scientists, and individuals. In these three methods of conserving plant genetic resources, there is no fixed responsibility for it and no way to administer its continuation. There is no inventory or information system about; access to the material is not certain; funding is usually inadequate; and material is extremely vulnerable to loss. The holders of such materials are free to discard all or part of it at their own discretion.

The U.S. Department of Agriculture and the State Agricultural Experiment Stations early in the history of this country recognized that these three methods should not be trusted for the safekeeping of genetic resources needed now and in the future. The fourth method of conservation is to have permanent collections maintained in the public interests by government agencies. The current system is a network of institutions and agencies (State, Federal, and private) working cooperatively to introduce, evaluate, document, and distribute germplasm. In contrast to the first three methods, this system is characterized by (1) fixed responsibility for maintaining germplasm in the public interest. The curators do not have the discretion of abandoning collections or discarding material unilaterally; (2) a funding plan administered to units of the systems; (3) a computer-assisted information storage and retrieval program; (4) the free availability of all materials to scientists and plant breeders; (4) cooperation with other national and international agencies.

Those of us who have tried to develop and strengthen this system know of its strengths and weaknesses. It is not a perfect system; it has not accomplished all that it should. Yet it is a good system that is the envy of many other nations and groups within the United States. It is the custodian of hundreds of thousands of samples of seeds. Each year it makes thousands of samples available to workers in the country and around the world. The system deserves strengthening and support. I want to stress that the conservation of plant genetic resources is not a new idea. It has been a policy of this government since colonial days, and as a nation we have contributed greatly to our national and the world effort in this task.

Mr. Chairman, if anyone is interested in contributing to the reduction of genetic vulnerability and to the conservation of germplasm, many positive actions could be taken to support ongoing efforts. I submit to you that opposition to this legislation contributes essentially nothing positive to these concerns.

In prior testimony the point was made that the price of seed had increased since the passage of the Plant Variety Protection Act. This is another obvious case of an erroneous cause and effect relationship. Inflation, resulting in increased cost of producting seed, is surely the real cause—not plant variety protection. Moreover, good seeds not only cost more but are worth more than poor seeds. The cost of seed is usually not a major item in the total cost of making a crop. It is money well spent to buy seeds that meet seed certification standards for genetic purity, germinability, and freedom from weeds. Lest issues are confused again, let me point out that seed certification standards apply equally to protected and unprotected varieties.

The plant variety protection certificate protects a genetic combination, a particular set of genes. It is not possible to protect a single gene or a single characteristic. Nor does the certificate deny anyone the right to use the protected genetic combination for cross breeding in an attempt to find better combinations.

Opponents of this legislation imply that planting seeds should not be an item for commerce, as, for example, are cars and refrigerators, on the grounds that these are non-living things that we can do without, but that seeds are the source of food, which we cannot do without. Seeds in public germplasm centers are national and international resources, and these seeds are freely exchanged without charge for research and breeding purposes. A handful of seed is enough for these purposes, and costs are not too great for the taxpayer to provide. If farmers and gardeners are to have the tons and tons of seed needed to plant the huge acreages devoted to cultivation, somebody has to produce the seed. There are considerable costs and financial risks involved. I think it is not inconsistent with our national philosophy for industry to provide needed goods and services for a reasonable profit. Again, the forces that led to large and even multinational companies are much more consequences of the modern business world than of plant variety protection. The farmers of this world desperately need a dependable supply of high quality planting seed. In my opinion, they cannot depend solely on saving their own seed or trading among neighbors. Plant variety protection does not prohibit these actions, but farmers have discovered that they must return to the originating breeder for good seed. Otherwise, the seeds "run out" and poor crops result. The reasons for this deterioration are well known and can be prevented by knowledgeable people following scientific principles. This is a good reason for having a strong, competitive seed industry.

Finally, Mr. Chairman, calls have been made for studies on the impact of this legislation. My response is that just about any action can be postponed until further studies are made. Even if additional studies were conducted, it would be most difficult, as we have seen in these hearings, to keep the discussion focused on the Plant Variety Protection Act Amendments and not let it digress to a discussion of plant variety protection in general, to the impact of plant genetics and breeding, to inflation, business expansion, and other world trends having little or nothing to do with these amendments.

In conclusion, I believe that these amendments should be passed as a matter of justice and equity to the breeders of the six vegetables. Those who oppose these amendments and plant variety protection in general, in my view, have damaged their case by bringing up completely erroneous claims and by attributing to the Plant Variety Protection Act world problems which are clearly not caused by it.

STATEMENT OF KATHERINE ANDERSON, DIRECTOR, BOTANICAL GARDENS PROJECT, GARDENS FOR ALL, BURLINGTON, VT.

Gardens for All, the National Association for Gardening, is a non-profit membership organization which promotes home and community gardening. One of our responsibilities to our members and to the rest of the nation's 33 million food gardeners is to monitor legislation which may affect them.

S. 23, the proposed amendment to the Plant Variety Protection Act of 1970, would extend patenting rights to six previously-excluded vegetables. Four of these are among the ten most popular home garden crops. For this reason, and because we feel there are some larger issues at stake here, we would like to present why we feel an objective evaluation by an impartial group of experts is necessary.

In seeking to understand this legislation and its possible effects on the home gardener and on our agricultural resources, we have considered the following: materials provided to us by representatives of ASTA in support of plant patenting; materials questioning extending patenting rights supplied by Cary Fowler, the People's Business Commission, and Pat Mooney's book "Seeds of the Earth"; many articles on both sides of the issue from various publications, transcripts of the hearings on the original 1970 legislation; statements by the USDA; and testimony submitted during the recent hearings in the House on H.R. 999. In addition we have spoken with Dr. Leese of the PVP Office and with people from various public organizations, even including the Office of Appalachian Ministry. In addition, we have tried to see plant patenting in light of the overall concept of patenting with the accompanying benefits and trade-offs to the patent holders and society as a whole.

We would like to stress that we have no vested interest in opposing this legislation. Our relations with the seed industry have always been friendly and supportive. They are concerned with protecting their financial investments, a position which is entirely understandable and valid. However, there are other factors which must be considered as well.

AN IMPARTIAL STUDY IS NEEDED

1. The actual impact of the 1970 patent legislation on the American backyard gardeners and farmers, and all those trying to fight inflation by raising their own food has not been explored. The proposed amendment appears to be minor relative to the large number of plants already patentable under previous legislation, and the controversy surrounding it blown out of proportion, but it is perfectly valid to ask what has happended so far before extending patent rights to still more vegetables. It is much more difficult to change a law once passed.

2. Because of polarization of views and needs, the public hearings have not led to an objective evaluation of the proposed legislation.

QUESTIONS THAT NEED TO BE ANSWERED BY AN IMPARTIAL STUDY

1. What effect has the Plant Variety Protection Act had on the seeds available to the consumer?

(a) One of the purposes of the PVP Act was to stimulate private research in the development of new and better varieties. We've had ten years of protection—Are there in fact more/better seeds today than there were in 1970 or in the 10 years preceding the patenting act? The answer to this question lies in a listing and evaluation of the varieties, protected and unprotected during this time, and an assessment of the influence of the PVP law.

(b) There has been a lot of talk about the narrowing of our genetic resource base. While there are many named varieties in existence, there is concern that they are very closely related and susceptible to disasters. In looking at what has happened in the last 10 years, and in comparing patented and non-patented varieties, it should be possible to determine what, if any, role the PVP Act has played in this tendency.

2. How has the PVP Act affected seed prices?

(a) Isn't this the crucial link of our agricultural system and therefore shouldn't we know what effect it has had and will have on the food systems of this country?

3. Who benefits from this legislation?

(a) Are all seed companies clearly the immediate beneficiaries? The intent is to protect small and large companies equally, and in theory this is true. A look at all of the patents issued in the last 10 years and who holds them would show if this is in fact benefitting the small independent companies as well as the large companies.

(b) Are all consumers being provided with high quality seeds and a wide selection of types suited to their particular needs and geographical region?

(c) How are plant patenting laws affecting our genetic resources? How can we encourage the development of new varieties while ensuring the perpetuation of older types?

(d) In the normal patent process it is our understanding that the developmental process becomes available to the public when a patent is granted. The question arises if there is a corollary process in plant patenting. If so, it would seem necessary that the breeding program would become public information. Is this happening?

It may well be that this legislation is in fact in the best interests of all, but we're simply not convinced at this time that we have enough information. We are not suggesting that the six vegetables mentioned in the amendment hold the key to the various issues which have been raised about patenting legislation; but we do request a close look at the record since 1970. This is necessary to protect the interests of the American public before extending patenting legislation. It may or may not be a costly process, but refusing to take a closer look now at all the ramifications may be far more costly in the future.

ADDITIONAL INFORMATION

Kit Anderson, Director of Botanical Gardening for Gardens for All has an undergraduate degree in botany and graduate studies in the field of biogeography, specializing in the history and domestication of the world's food crops. She is a member of the Society for Economic Botany.

A few organizations which we feel are unbiased and qualified to handle such research might be: (a) National Science Foundation; (b) Brookings Institution; and (c) AEI.

Statement of Jack Doyle, Washington Representative, Environmental Policy Center

My name is Jack Doyle, I am a Washington Representative for the Environmental Policy Center, a non-profit public interest group specializing in energy and natural resource policy at the national level. Over the last few years at the Environmental Policy Center, I have had the opportunity to work with several of the nation's farm organizations on legislative issues of mutual interest, especially on energy bills involving agricultural land and/or agricultural water. Due to that work on energy and land issues involving the farm community, I have become very concerned about national agriculture policy, our nation's food-producing resource base, and the preservation of small-business agriculture. Last November and December, I spent nearly four weeks traveling around the country and meeting farmers and rural citizen groups while following Secretary of Agriculture Bob Bergland on his ten-city Structure of Agriculture tour. I attended all ten of USDA's regional "structures" hearings, and listened to well over 300 farmers, rural citizens, farmworkers, consumers and others express their views about the future of U.S. agriculture and the kinds of policy changes they wanted USDA to make. During that trip, I visited farmers in their homes and on their land in Arkansas, Iowa, Texas, Colorado and California. The first time I heard about the seed issue was from a dryland cotton farmer standing in his wind blown cotton field during harvest somewhere in the High Plains of Texas between Vernon and Hereford. He said he didn't like the idea of 4 or 5 seed breeders getting all the benefits. I am beginning to learn what he meant by that.

The kinds of seeds that are planted in this good land of ours can determine, in no small way, Secretary Bergland's Structure of Agriculture. Seeds are the beginning of that structure. They might determine how profitable a small farm is compared to a large farm, or how much water, fertilizer or energy a farmer's field production will require. Seeds are potent economic and structural determinants; they should not be taken lightly.

The Environmental Policy Center believes that the amendments before us today have a very direct bearing on questions related to agricultural structure, genetic vulnerability, environmental issues, agricultural energy requirements, agricultural chemical requirements, small farm survival, nutritional considerations, and lastly, issues of corporate concentration in seed production, distribution, and marketing.

These amendments do not simply include "six little vegetables" that have nothing to do with the issues just mentioned. These amendments have everything to do with those issues because they spring from the rationale behind plant patenting and the notion of a worldwide seed cartel.

The Environmental Policy Center does not, at this time, support moving ahead with these amendments until a series of questions have been answered in some detail and subject to further review by Congress, the scientific community, farmers and the general public. Plant patenting and plant variety protection laws have never been fully scrutinized for their long-term biological, agricultural and economic impacts.

In the normal course of considering whether amendments such as those before us today ought to be adopted, or whether an Act's powers or authority ought to be extended to a broader or longer list of items or commodities, is it not ordinarily prudent to consult the prior performance record of the Act in question, to see how it has managed its present list of charges and responsibilities? In the case of the Plant Variety Protection Act of 1970, however, that would be difficult, if not impossible, to do. First of all, Congress has never conducted oversight hearings on the performance of the Act since 1970. Secondly, there are aggregate data—or at least no data prepared for public inspection—on the overall performance of the Plant Variety Protection Act which sufficiently answer all of the questions raised about the Act and about the success or failure of plant patenting since 1970. Thirdly, since 1970, there have been a whole range of developments and revelations, including the energy crisis, global food shortages, and revelations about the way multinational corporations work—events and information which Congress could not foresee in 1970, but which today may have a direct bearing on whether and how certain forms of protection ought to be extended to the nation's and the world's food-producing resources.

If we examine the Plant Variety Protection Act of 1970 from the perspective of the trends that have developed in the seed industry in this country and elsewhere since 1970, it is fair to ask whether it is desirable for these same trends to be extended to six more vegetable crops, some of which have a considerable potential for worldwide use. And if it is found that the trends which have occurred since 1970 are the result, even in part, of the Plant Variety Protection Act and the trend toward worldwide patenting of plants, then would it not be prudent to slow down and make sure we do not extend the same pattern to six more vegetables and the industries and farmers attached to them?

Since 1970, there have been two trends occurring almost simultaneously in the seed industry, both of which have a bearing on the shape of that industry, the structure of agriculture in this country, and potentially, on environmental, genetic, and consumer questions as well. One trend is the entry of large agrichemical, energy, pharmaceutical firms and grain traders into the seed business through the acquisition of smaller seed companies. The other trend is the emerging dominance of these large non-farm corporations and multinationals, through their newly acquired subsidiaries, as the leading recipients of plant patents for major agricultural crops in the U.S. and around the world.

In North America, for example, approximately 54 seed companies have been acquired by 25 major U.S. and foreign corporations since 1970. Still other such takeovers are being negotiated. Firms such as Union Carbide, Royal Dutch Shell/Olin, Pioneer Hi-Bred, Sandoz, Celenese, Pfizer, Anderson-Clayton, Ciba-Geigy and Cargill have separately acquired three or more seed companies each to do their bidding in the seed trade. One explanation for these takeovers, and for the multinational's new found interests in agriculture, is, no doubt, the healthy rate of return experienced by the seed industry in the 1970s. In the mid 1970s, for example, Business Week reported that seed industry profits were growing at an annual rate or return of 19%. Seed houses handling hybrid corn varieties experienced great worldwide demand between 1972 and 1975, during which time their average profits increased some 20% a year.

Now, one might fairly ask, "What does the Plant Variety Protection Act of 1970 have to do with mutinational corporations taking over smaller, profitable seed businesses"? Proponents of this legislation say that it has nothing whatsoever to do with such takeovers. While the Plant Variety Protection Act in itself might not provide the sole impetus for seed company takeovers, certainly the assurance of exclusive marketing rights for new protected varieties of agricultural crops has to figure into the equation, and surely must be comforting to the multinational waivering about such a market venture. In fact, a 17- to 18-year protection period for exclusive marketing of protected varieties must in itself be quite persuasive to a multinational thinking of venturing into the burgeoning world food market.

A vast, potential worldwide market in seed-reproduced plants is depenedent on one thing: patenting. Patenting is the commerical imprimatur that the seed industry needs to market favored varieties of hundreds of different kinds of crops around the world. Patenting gives the needed measure of control and economic protection that large corporations need for a minimum-risk proposition. And for many of the large corporations now entering the seed business, the seed trade is not a far reach from other related market interests. Pharmaceutical firms see a potentially compatible growth area that fits in nicely with their research and laboratory orientation; agrichemical firms see potential cost economies and profits in doing joint seed/agrichemical advertising, marketing and distribution; and large trade firms such as Cargill see clear advantages in being able to deal in both the grain trade and the seed trade on a worldwide basis.

The second development which is taking place in the U.S. seed industry relates to the number of patents issued by USDA to multinational firms, or to their subsidiaries. For example, in the book, Seeds of the Earth, an analysis of 562 patent certificates issued by the U.S. Plant Variety Protection Office through March of 1979, reveals that some 46 percent of these certificates were issued to the same dominant 17 firms who have been most active in acquiring small seed companies. These corporations include Sandoz, ITT, Union Carbide, Purex, Upjohn, Pioneer, Anderson-Clayton, Shell/Olin, Cargill, Celanese, KWS, and Ciba-Geigy. Of all patents issued as of that data, some 72 percent went for six crops, and predominantly to these same corporations. In a second analysis of U.S. patent certificates, completed by the National Sharecroppers Fund of North Carolina, it is shown that a few major corporations are receiving protection certificates for major agricultural crops and vegetables (see table).

Crop variety	Number of corporations	Percent of U.S. patent certificates issued in that variety
Soybeans	4	48
Peas	2	43
Wheat	4	36
Lettuce	4	60
Beans	3	80
Cauliflower	2	100
Cotton	4	45
Barley	4	69
Sweet peas	2	100
Rice	3	77
Safflower	2	66
Tobacco	3	100
Alfalfa	1	37
Oats	1	42
Onions	3	100
Peanuts	5	85
Lima beans	1	75

Source: Compiled by the National Sharecroppers Fund, Wadesboro, N.C., based on data from the U.S. Office of Plant Variety Protection, through December 1979.

In the analysis of patent certificates prepared by the National Sharecroppers Fund, the names of the same corporations keep coming up time and again in each of the crop categories listed in the foregoing table. For example, Sandoz is among the top four patent holders of soybeans, peas, wheat, and beans; ITT and Union Carbide are the top two patent holders in lettuce; and Royal Dutch Shell/Olin is the fourth ranking holder of patents in soybeans.

These companies, no doubt, see great promise in a worldwide seed market in which they have both protected marketing rights to certain plant varieties, and specified countries, or regions within countries, to market those varieties. Already in the U.S., for example, the four firms which dominate the hybrid seed corn market—controlling between 62 percent and 68 percent of that market—appear to have specialized in certain regions of the country. Dekalb, Sandoz, Ciba-Geigy and Pioneer each have a good share of the seed corn market in separate and distinct areas of the U.S. Little data exists on these kinds of patterns, but is certainly needed for all agricultural crops if we are to know the full extent and potential for corporate control of seed marketing and distribution in this country.

In his book, "Merchants of Grain," Dan Morgan reports that in the Fall of 1977, Cargill and Continental had "a corner" on certain new varieties of Mexican wheat seed, making it near impossible for certain independent grain dealers in Europe to acquire additional wheat seed from Mexico when they unexpectedly ran short in a promised deal with one of their customers. Cargill had found that Mexican wheat seed was a lucrative enterprise, especially since the new "miracle" wheats developed in Mexico were priced on the world market at two to three times the price of regular wheat. Both Cargill and Continential had been forward contracting with Mexican farmers and Mexican cooperatives to insure an adequate supply of wheat seed for commercial trade, and in some cases where guaranteeing Mexican farmers the extra costs of raising wheat for seed as compared to growing wheat for regular marketing. In this way, Morgan writes, private companies such as Cargill and Continential, could have a call on a substantial amount of miracle wheat from Mexico.

Might the same patterns be repeated for other "miracle" strains of agricultural varieties around the world? And might such patterns of farmer contracting and marketing develop around seed that is patented? Right now, in this country, do we know how much seed is grown by farmers; what kinds of farmers are growing seed; how much seed is exported; who the seed is grown for; and what companies are exporting and/or contracting with farmers for seed?

PRESENT USE AND AVAILABILITY OF SEED VARIETIES

The National Academy of Sciences has identified the limited number of varieties used in the planting of major U.S. crops, and the proportion of crop acreage devoted to these varieties. NAS has found, for example, that three varieties of cotton account for 53 percent of all cotton acreage; 3 varieties of snap peas comprise 76 percent of all planted snap bean acreage; and two varieties of peas account for 96 percent of all U.S. acres planted in peas. The list goes on like this for wheat, corn, millet, peanuts, rice, etc. In its 1978 study "Conservation of Germplasm Resources: An Imperative," NAS reiterated a finding it made in 1972: "The genetic underpinning of (crop) varieties currently grown in the United States is *dangerously narrow,* and these varieties *have proved susceptible* to changes in exposure to pathogens or in environmental conditions." (Emphasis added.)

The amount of agricultural acreage given over to such a few varieties of crops as indicated by the Academy, prompted us to take a closer look at some of these crops on a state by state basis. Some charts that we have compiled on selected crops and for certain states are attached to this testimony. We would like to briefly summarize here some of our findings from this data.

The Georgia Crop Reporting Service has compiled in its latest "Georgia Agricultural Facts" a list of the three leading varieties of soybeans by percent of harvested acreage for each of 17 states for the 1978 crop year. By totalling the three top listed categories for each state, we found that the top three varieties comprised at least 42 percent of the total harvested soybean acreage for every state listed. Eleven of the 17 states had 50 percent of more of their soybean acreage in the top three varieties; 10 had more than 60 percent; 6 had more than 70 percent and one, Georgia, had 86.6 percent. Georgia, Minnesota, Missouri, North Carolina, South Carolina and Tennessee had more than one-third of their total harvested soybean acreage planted to one variety of soybeans. Georgia and North Carolina had more than 50 percent of their acreage in one soybean variety. In Illinois, 35 percent of the planted soybean acreage, planted in the variety Williams, amounts to 3.2 million acres in that one variety. In Kentucky, where soybean acreage has more than tripled in the last decade, three varieties of seed—Essex, Williams, and Mitchell, now comprise 70 percent of all planted soybean acreage, amounting to more than one million acres, predominantly in the western and north central part of the state.

In a sampling of other state crop records we found similar patterns in other crops. In Virginia, for example, 92 percent of the planted peanut acreage in 1979 was seeded to one variety, Florigiant. However, what may be more problematic in the event of pestilence or blight is that the peanut region in Virginia is concentrated in the southeastern corner of the state in just 9 counties over some 103,000 acres, where most of the Florigiant variety is planted. In the state of Washington, 74 percent of the planted barley acreage—some 298,450 acres—in 1978 was in one variety of barley called Steptoe. Steptoe is also used in Wyoming and Colorado, where it is among the top three varieties which encompass 50 percent or more of the barley acreage in those states, Three varieties of wheat—Abe, Arthur and Arthur 71—comprise 70 percent of the wheat acreage in Illinois and Indiana, and about 65 percent in Missouri. Four varieties in winter wheat—Eagle, Scout, Sage and Centurk—comprise some 66 percent of all planted wheat acreage (or about 7,458,000 acres) in Kansas during 1978. Kansas produces about 17 percent of the nation's wheat on about 11 million acres. These same varieties dominate winter wheat plantings in Wyoming and Colorado.

The data we examined from the various state crop reporting services also suggested to us that new varieties can be rapidly put to use, or old ones rapidly phased out, over a widespread area within the matter of a decade or even a few years. For example, in 1963, the three leading varieties of soybeans used in Kentucky were Clark, Hood and Ogden. By 1973, not one of these varieties made up as much as one percent of the planted soybean acreage in Kentucky. In 1974 in Virginia only 7.4 percent of the soybean acreage was planted to the variety Essex. By 1979, Essex was planted on some 246,000 acres, comprising nearly 50 percent of all Virginia soybean acreage.

THE INSTITUTIONAL PROBLEM AND THE ROLE OF THE FARMER

The problem we are facing here is not only a problem of patenting certain lifeforms that may be impossible to distinguish for the purposes of legal enforcement and plant breeder protection, but we are also faced with an institutional infrastructure and business relationships which facilitate the use of new varieties of seed on a large scale and almost overnight. I am talking about the relationship between land grant universities, the commercial seedsmen and the farmer.

Farmers are always looking for new and improved seed. Seed that will improve their yields, and therefore increase their return on investment. It has been shown that farmers who pay more for seed if it is known to produce higher yields. Nothing wrong with this, it's just good business sense from the farmer's point of view.

However, according to one Extension Service research agronomist in Virginia, farmers in his area will take the advice of the Extension Service on new varieties "at the tip of a hat". "It almost scares us," he said.

Farmers will listen assiduously to the advice of their neighbors and the Extension Service in the type of seed they should use. That's precisely the problem with touting the superior virtues of some new and improved variety: every farmer will plant it hoping for maximum return on investment. With this kind of advice and these kinds of practices, are we planting the seeds of future disasters and future disaster programs that will dwarf what the government now pays out in any given "bad year"?

Furthermore, we may be drifting toward a time, when in the interest of plant protection and plant breeder rights and patent holders, the government and the land grant complex will attempt to prohibit or advise against the use of "exotic" seeds, that is, any seed that is not patented.

Plant patenting and plant variety protection laws are forms of centralizing genetic information. While it may be true, as USDA points out in its latest Legislation Update of Plant Variety Protection Law, that "each new variety adds to the diversity of material available to growers," the issue is access to that diversity. Farmers cannot afford computer consoles and information retrieval systems. While there is no debating the merits of collecting genetic information on a national and global basis for research purposes, and using computers to facilitate this process, there are some real questions about who will have access to, and who will most benefit from, the operation and development of such systems.

If more small commercial seed breeders and small seed businesses are profiting and proliferating as a result of the 1970 Plant Variety Protection Act, then why do an increasingly shrinking number of large multinational companies hold patents on crops such as lettuce, beans, peas and soybeans and wheat? The number of small research firms going into research and plant breeding is not reassuring in its own right. In time, many of these small firms will be subcontracted or taken over by the majors or prevented from marketing their seed through the greater promotional reach of the larger companies.

Some observers believe that agriculture is at a crucial juncture in terms of change. They are talking about a second revolution in modern agriculture. This revolution in modern agriculture may not be so much a revolution that benefits the farmer and the consumer so much as it benefits the corporation, the manufacturer and the processor. This second revolution may not be a revolution in a cornucopia sense of quality foods and healthy farms so much as it might be a change in corporate strategy: a shift in marketing and production emphasis that moves from a hardware, factory-oriented approach in agriculture, to one that encompasses control of the biological elements of production, beginning, crucially, with seeds.

Dr. Erna Bennett, a genetic conservationist with the FAO, has explained how "marketability" and genetic selection can interact to have a negative effect on consumer, producer and plant breeder:

"In a society whose economics are dominated by market considerations it is inevitable that these will eventually eclipse all others in determining what is grown and offered for sale. What matters most in such circumstances is salability—shape, colour, size, yield (insofar as it affects price and therefore marketability), popularity with the consumer and such factors. Nutritive value, a factor affecting the consumer, and adaptability to soil and climatic conditions, a factor affecting the plant breeder and determining the chances of further genetic improvement in the crop concerned have no place in such a scheme of classification. Capacity to store well, to travel well, to respond well to mechanical harvesting and handling (characteristics often adversely affecting the flavour, tenderness and palatability of a vegetable) rate high. Disease resistance rates high also, though disproportionate attention is paid to diseases not affecting quality or yield but adversely affecting the marketable appearance of the crop."

SEEDS, AGRICULTURAL STRUCTURE, AND THE IMPORTANCE OF DIVERSITY

Seeds are a determinant of agricultural systems. They can determine economies of scale for certain crops and kinds of farming. They can be bred for desirable characteristics which play to one kind of farming or another. They are literally the seeds of agricultural structure.

The on-site structure of a farm, its organization and operation, begin, in many ways, with the kind of seed that is planted in the ground. The composite structure of farms throughout the nation, or the agricultural system as a whole, derives from these individual farms. Agriculture that begins with the information that rests in seeds can determine in large measure how much farm machinery of a given type is sold, how much energy is consumed in planting and harvesting, whether certain plants lend themselves to continuous cultivation or mechanical harvesting, etc. . . .

However, there will never be one "super seed" that does it all. Never in a million years of evolution or in milenia of experimentation and breeding in the laboratory. There are limitations on what kind of improvements man can make on nature. History has certainly taught us that much. Nature's gift of wealth to us is in her diversity; our task is to understand that diversity and use it constructively. We have seen the limitation of man's work in the hybrid seed.

There is more to diversity in agriculture than dairying in Vermont; growing corn in the Midwest; wheat on the Northern Plains; tobacco and peanuts in the Southeast; fruits and vegetables in California; or cattle in the West. And while USDA has often touted diversified agriculture in America from region to region, the real question is an agricultural system capable of absorbing, marketing and sustaining agricultural diversity within farming regions and on individual farms.

Scientists, economists and biologists all recognize the value of diversity in maintaining system viability. In the business and investment communities, diversification is an important strategy. "Diversified portfolios" are the investor's best insurance plan in unpredictable markets. Diversification in business is a way of protecting against total failure. Should the "investment strategy" for the nation's food-producing resource base be any less protective or broadly grounded?

Seed development that enhances agricultural diversity and the diversity of product quality and product types might be oriented to specific geographic regions. The USDA should be using its considerable energies to expand our nation's nutritional genetic base by looking to various regions of the country for ways to diversify agricultural production within those regions through the use of new seed varieties or hardier varieties. One goal of seed research should be to help diversify crop production within regions to insure against total vulnerability. The development of seeds for particular regions is not a desirable goal for a multinational corporation which is looking for a large and uniform market. Smaller seed companies, however, of the kind that are being acquired by the multinationals, would be appropriate small business suppliers for diverse seed needs of these regions.

Diversity in agriculture is an important germplasm conservation strategy as well. Small farmers using traditional varieties, seed collection and storage programs, free exchange of scientific information, encouraging farmer cooperatives to become involved in plant research and breeding programs—all these approaches can be supportive and beneficial. Collectively, they can insure against the total failure of the system. Similarly, maintaining native habitats and known progenitors is also an important conservative strategy. Set aside programs might allow farmers to use set aside lands for their own plant breeding and experimentation. There are many other possibilities as well.

On the other hand, a course set in USDA that enables any narrowing of plant material or its control for the protection of proprietary interests, is indeed a course that is counterproductive to diversity in agriculture. It may be one which subtly leads the agriculture of this nation into increasingly narrowing, more subtler forms of biological control over farming, further squeezing the embattled family farmer in the already tightened prodution and marketing margins that he constantly faces.

If the Secretary of Agriculture is serious about a structure of agriculture that promotes many different kinds of agriculture in the interest of insuring against the failure of the total system, then the Department should begin with a careful review of its own plant patenting role, and what plant patenting means for consumers, farmers and environmental quality.

SOME NOVEL CHARACTERISTICS FOUND IN U.S. PLANT PATENTS

We recently reviewed some of the data on plant patent certificates found in the Official Journal of the Plant Variety Protection Office. In a random, unscientific examination of 72 new agricultural crop varieties for which patent certificates were issued by the U.S. Plant Variety Protection Office over the nine month period May 1975 through December 1975, the distinguishing or novel features of these new varieties, as listed in the Official Journal, were grouped in the following manner:

Color of seed; mentioned 7 times.

Physical differences in shape, size or appearance of seed; such as being wrinkled or smooth, oblong, etc.; mentioned 9 times.

Characteristics having to do with size, weight, shape, strength, appearance, etc., of fruit, fiber, kernals or pods (e.g., descriptions such as "sieve size peas", "semi-hard kernals" or "after blanching, pods are brighter and greener"); mentioned 22 times.

Tolerance to plant blights, leaf rusts, or plant viruses; mentioned 2 times.

Resistance or moderate resistence to plant blights, leaf rusts, or plant viruses; mentioned 13 times.

Resistance to root rot; mentioned 1 time.

Resistance to nematodes; mentioned 1 time.

Resistance to pestilence; mentioned 1 time.

Susceptability to plant blights, leaf rusts or plant viruses; mentioned 4 times.

Resistance of certain parts of plant (esp. cotton bolls) to storms; mentioned 4 times.

General physical characteristics of plants, such as size, weight, height, leaf size or shape, etc.; mentioned 32 times.

Maturity of plant; (e.g., maturing earlier or later; "heads two days earlier", etc.); mentioned 25 times.

Whether plant would "lodge" or lean toward the ground; whether more or less lodging resistance; mentioned 3 times.

Chemical composition or chemical characteristics of plant; mentioned 1 time.

Color of plant's flower or color of fruit, kernals or hulls; mentioned 9 times.

Restoration of fertility to hybrids; mentioned 2 times.

Among the 72 new varieties, and all the distinguishing features mentioned for these varieties, there was only one oblique reference made to flavor, and no mentioned whatsoever of general nutritive value, or how much or how little fertilizer, herbicide, water, or energy any of these new varieties might require or might displace.

And while the foregoing survey may not be completely scientific, it does seem to indicate that the overwhelming distinguishing characteristics cited for new plant varieties turn out to be those related to plant color, size, durability, harvestability, plant maturity, etc.

Characteristics that are non-functional such as color of seed or markings on the seed, etc., or characteristics which facilitate mechanized harvesting, processing, shipping, or have some appealing characteristic for consumers that does not necessarily relate to nutrition. In fact, nutrition is rarely if ever mentioned.

SEEDS AND THE FUTURE

There are subtle obligations that come with eating the fruits which come from our biological storehouse; they include not tampering with the composition of that storehouse so as to restrict the range of its operation and evolution. This is a reciprocal relationship, one of studied and careful symbiosis, a symbiosis that we do not yet fully understand from the side of the plant. Very simply, we owe more than we take, and that debt may soon be catching up to us.

Plant patenting may be infringing on a public right of choice, a basic right of sustenance, of what kinds and types of food we eat, of the nutritional value of the foods we eat, of how they are produced, and of what social cost is entailed in producing them. Seed patenting will help to further vertical integration of agriculture—literally from the ground up—field-to-table control over what Americans and others eat. Farmers will increasingly become tenants, even on their own land, as input prices are increasingly controlled by a few suppliers and little meaningful anti-trust action is taken.

The seed issue—and patenting in particular—encompasses the worst features of both monopolistic controls and biological tampering, and may be laying the groundwork now that will entail countless hours and cost millions of dollars to unravel, in endless legal battles, anti-trust and life-form controversies. Congress should take a very cautious posture with regard to this matter. It is on a crucial threshold that has wide ranging ramifications for farmers, consumers, and national security. This subcommittee, in particular, and that of Judiciary and possibly Science and Technology, need to carefully review legislation of the kind before us today for the long-run ramifications and implications.

On the other hand, if Congress and the Administration insist on continuing the plant patenting track that they are on, new criteria should be established for plants that are to be given patents, i.e., criteria that reflect nutritional, quality and environmental goals, and which also serve to broaden the biological base, reduce environmental impacts and energy requirements (fertilizers, herbicides, pesticides, etc.) and enhance environmental values (hold soil, fix nitrogen, attract beneficial insects, etc.) Since the public has control over issuing such patents, the performance of those patented varieties should be of maximum public benefit. As it stands today, that does not seem to be the case.

SOYBEANS: DISTRIBUTION OF MAJOR VARIETIES, SELECTED STATES

[Percent of acreage harvested, 1978 crop [1]]

State	Leading varieties by percent of acreage harvested						Total percent, top 3 varieties
	First		Second		Third		
	Name	Percent	Name	Percent	Name	Percent	
Alabama	Bragg	28.9	Ransom	19.0	Lee [2]	12.7	60.7
Arkansas	Pickett [2]	27.6	Forrest	23.8	Lee [2]	15.4	66.8
Georgia	Bragg	73.9	Davis	8.2	Ransom	4.5	86.6
Illinois	Williams	31.1	Corsoy	7.8	Wayne	7.5	46.4
Indiana	Williams	27.5	Calland	11.5	Amsoy [2]	10.2	49.2
Iowa	Corsoy	27.0	Wells	8.2	Williams	7.1	42.3
Kansas	Williams	20.0	Clark [2]	17.0	Columbus	9.0	46.0
Kentucky	Essex	31.3	Williams	26.9	York	11.9	70.1
Louisiana	Davis	26.8	Bragg	26.8	Forrest	24.2	77.8
Minnesota	Corsoy	36.8	Hodgson	25.8	Swift	9.3	71.9
Mississippi	Bragg	24.0	Lee [2]	20.3	Davis	12.2	56.5
Missouri	Williams	44.2	Forrest	10.6	Mack	8.4	63.2
Nebraska	Amsoy [2]	21.9	Williams	14.8	Woodworth	8.6	45.3
North Carolina	Ransom	53.5	Bragg	18.3	Forrest	7.0	78.8
Ohio	Calland	19.6	Williams	16.5	Wayne	10.7	46.8
South Carolina	Bragg	36.6	Ransom	15.5	Bossier	10.6	62.7
Tennessee	Forrest	41.8	Essex	17.6	York	15.3	74.7

[1] Reported for sample fields used for obtaining objective data.

[2] Includes varieties with additional numerical designations such as Amsoy "71", Pickett "71", etc.

Source: Adapted from "Georgia Agricultural Statistics," 1977–78, Georgia Crop Reporting Service, November 1979, p. 41.

CROP VARIETY DISTRIBUTION FOR SELECTED STATES AND SELECTED CROPS

State	Crop	Variety	Percent crop acreage planted to that variety	Actual acreage in that variety
Arkansas (1978)	Soybeans	Pickett	27.6	1,297,000
		Lee	15.4	724,000
		Forrest	23.8	1,119,000
Colorado (1978)	Winter wheat	Scout 66	21.8	632,200
		Baca	15.9	461,100
		Scout	19.0	551,000
		Centurk	17.0	493,000
	Barley	Moravian III	31.7	88,760
		Otis	18.1	50,680
		Steptoe	17.3	48,440
		Klages	10.4	29,120
Illinois (1978)	Soybeans	Williams	35.0	3,237,500
Illinois (1979)	Wheat	Abe	22.0	345,400

CROP VARIETY DISTRIBUTION FOR SELECTED STATES AND SELECTED CROPS—Continued

State	Crop	Variety	Percent crop acreage planted to that variety	Actual acreage in that variety
Kansas (1978)	Winter wheat	Arthur	16.0	251,200
		Arthur 71	34.0	533,800
		Eagle	23.0	2,599,000
		Scout & Scout 66	19.6	2,214,800
		Sage	14.0	1,582,000
		Centurk	10.0	1,130,000
Kentucky (1978)	Soybeans	Essex	70.0	1,015,000
		Williams		
		Mitchell		
Maryland (1974)	Wheat	Arthur	32.4	
		Redcoat	26.7	
		Blueboy	18.0	
		Arthur 71	14.0	
Virginia (1979)	Peanut	Florigiant	92.0	94,800
	Barley	Barsoy	16.6	19,400
		Maury	10.3	12,100
		Rapidan	15.6	18,200
	Soybeans	Essex	49.3	246,500
		York	29.6	148,000
	Wheat	Arthur[1]	51.6	110,000
		Abe	16.2	34,800
Washington (1978)	Barley	Steptoe	74.6	298,450
Wyoming (1978)	Winter wheat	Scout 66	15.2	49,704
		Cheyenne	24.7	80,769
		Lancer	16.8	54,936
		Centurk	16.5	53,955
Wyoming (1979)	Barley	Klages	41.4	60,440
		Steptoe	9.0	13,140

[1] Including Arthur 71.

Source: Table compiled by the Environmental Policy Center, Washington, D.C. Based on data derived from State agricultural statistics and crop reporting service reports.

ENVIRONMENTAL POLICY CENTER,
Washington, D.C., June 25, 1980.

Hon. DONALD STEWART,
Chairman, Senate Subcommittee on Agricultural Research and General Legislation,
Russell Senate Office Building, Washington, D.C.

DEAR SENATOR STEWART: This letter is submitted as an addendum to our testimony of 18 June 1980 before your subcommittee on the Plant Variety Protection Act of 1970.

While we have expressed our concern over the limited scope and nature of the criteria used under the Plant Variety Protection Act in determining patent eligibility, we would like to suggest that the "definitions and rules of construction" section of the Act under Subchapter II—Protectability of Plant Varieties and Certificates of Protection—be the focus of some detailed inquiry during further congressional consideration of plant patenting and/or further questioning of the U.S. Plant Variety Protection Office.

We are concerned, as we indicated in pp. 18–19 of our statement, that under the Act's criteria, the overwhelming novel or distinguishing features of new patented plant varieties tend to be those which relate most directly to size, shape, color and performance of the plant variety, particularly with regard to harvestability, durability in processing and shipping, and other non-nutritive marketing considerations such as color and appearance.

If the Plant Variety Protection Act is to serve a broad public interest in offering long-term exclusive marketing rights to developers of new plant varieties, then we feel that those new varieties—especially agricultural crop varieties—should meet certain qualitative performance standards, and that patents for those new varieties be conditioned upon meeting those performance standards. Without question, two of those performance standards should be genetic diversity and nutritional value.

In a statement submitted to the hearing record by plant scientist Gary Paul Nabhan, it is noted, "the PVPA (The Plant Variety Protection Act) simply encour-

ages the proliferation of named, visibly distinct crop varieties, but that these new varieties can all be derived from the same limited genetic base." In his statement, Habhan explains, for example, that four new varieties of beans "are hardly an improvement in genetic diversity, if over 90 percent of their genes are from one parent." Nabhan believes that there is "great redundancy in new varietal releases, and that very few (of the new varieties) add to the available genetic diversity." In his statement, Habhan points out: "Genetic diversity does not simply mnean the number of available varieties; it is a scientifically measurable factor that takes into account—the distinctiveness of the genetic make-up of each variety—*as well as the variation within the gene pool as a whole*" (last emphasis ours). This kind of genetic diversity test is not presently a part of the Plant Variety Protection Act. The U.S. Plant Variety Protection Office should have to make a written finding that such genetic diversity exists—particularly in food crops—before a patent is issued for a new variety.

Secondly, in dealing with the genetic information of food crops through plant patenting, the U.S. government is also dealing with human sustenance, and therefore, human health, human growth and human performance throughout the national economy. Yet, in the patenting process of new varieties of food plants under the Plant Variety Protection Act of 1970, human nutrition is not accorded a determinant role. Like genetic diversity, nutritive value should be incorporated into the Act as a performance standard that breeders of new crop varieties should have to satisfy before receiving a plant patent from the U.S. government.

Moreover, before new crop varieties are patented, they should have to demonstrate some quantifiable nutritional improvement. Such nutritional requirements for new crop varieties could help to improve the qualitative and economic value of U.S. crop yields on a per acre basis throughout the nation, producing more valuable crops than higher-yielding varieties that do not have the improved nutritional characteristics.

In addition to incorporating performance criteria such as genetic diversity and nutritive value into the Plant Variety Protection Act, other performance criteria such as those relating to energy use, water use, resistance to blight and pestilence, etc., should also be examined for their economic value to the nation as possible performance requirements for new agricultural crop varieties.

Our final additional point has to do with the concept of plant breeder liability. To incorporate a provision in the Plant Variety Protection Act which would make plant breeders and/or seed company developers and sponsors liable for developing new patented crop varieties that are genetically vulnerable; genetically weakened; susceptible to known plant diseases, blights, or pestilence; or which convey known toxins or carcinogens into the food supply, would make the plant breeding process a more rigorous, more accountable and more socially responsible scientific process.

EPC believes that plant breeder liability should be considered in all its aspects, particularly since a toxic or environmentally vulnerable crop variety could have wide ranging economic and government payment impacts in the agricultural and/or consumer sectors. The U.S. Plant Variety Protection Office, the plant breeder and the parent seed company should all be held accountable for the crop varieties they develop, and each should be subject to specific liability provisions under the Plant Variety Protection Act.

We respectfully request that these additional remarks be printed in the hearing record for 18 June 1980. Please contact us if you have any questions on these remarks or related matters.

Sincerely,

JACK DOYLE,
Washington Representative.

STATEMENT OF DONALD R. DUNNER, THE AMERICAN PATENT LAW ASSOCIATION, ARLINGTON, VA.

Mr. Chairman, and other members of the Committee, I am Donald R. Dunner, President of the American Patent Law Association. The American Patent Law Association is headquartered in Arlington, Virginia and is a national organization composed of patent, trademark and copyright attorneys. The Association is in favor of the amendments to the Plant Variety Protection Act and would like to offer comments relating to the amendments and opposition statements to them. There have been several well meaning but highly emotional and erroneous statements relating to the effect that the amendments and the law itself have or will have upon the nation's food supply.

The Association thinks it very important at this time to comment on the amendments because, as everyone knows, we are experiencing a serious lag in innovation in the United States. The Association believes that the Patent, Plant Variety Protection, Copyright and Trademark Laws provide strong incentives for industry to invest in research and development.

I would like to briefly review plant protection legislation in the United States, setting forth the Association's position on the benefits of the Plant Variety Protection Act in general and the proposed amendments specifically, and then respond to some of the statements made by opponents of the amendments.

LEGISLATION PROVIDING FOR PLANT PROTECTION IN THE UNITED STATES

Two pieces of legislation provide patent-like protection for plants in the United States. The first, the Plant Patent Act of 1930,(1) affords protection for asexually reproduced (by cuttings, grafts, etc.) plants except for tuber propagated plants. The second, the Plant Variety Protection Act of 1970,(2) affords protection for sexually reproduced (by seeds) plants other than hybrids, bacteria, fungi and six excluded species.(3)

The Plant Variety Protection Act of 1970 is modeled along the lines of our patent laws. Its purpose is to promote progress in agriculture by providing plant breeders with a limited exclusive right on new sexually reproduced plant varieties in exchange for the plant breeders' disclosure of how to reproduce the variety.(4)

The limited exclusive right provides the plant breeder with an opportunity to recoup the investment made in the development of the variety. Furthermore, by disclosing details about the variety and depositing it in a germ plasm preservation center, other plant breeders can experiment with the variety. Without a system providing limited protection for plant breeders and seed companies, it is submitted that many of them would not disclose details of their new varieties.(5)

SPECIFICS OF THE AMENDMENTS

The amendments contained in S. 1580 would provide protection for okra, celery, peppers, tomatoes, carrots and cucumbers under the Plant Variety Protection Act. These six species were excluded because of the opposition by several of the larger food processing companies. The fears of those companies have proven to be unfounded and they no longer oppose plant variety protection for the excluded species.(6) The amendments will add no additional layer of protection. They will merely extend the protection to the excluded species that is already afforded to over 350 species.(7)

The value of these amendments and the Plant Variety Protection Act were best summed up by a noted Botanist, Dr. Gilbert S. Daniels, as follows:

"Thus the plant patent laws ensure a viable supply of seed and a guarantee of continued availability of genetic resources. No such guarantee or organized storage of unpatented seed exist. The National Seed Storage Laboratory contains many unpatented varieties, but it has to locate such material on its own. So plant patents actually help to preserve old varieties, not lead to their loss . . .

". . . Support of plant patent laws will help in part to guarantee future availability of a portion of our plant gene pool resource and will provide incentives for an ever improving stream of new plant varieties. Personally, I am in favor of continued plant patent laws and the proposed amendments to the Plant Variety Protection Act."(8)

The amendments also would extend the period of protection from 17 to 18 years, clarify some provisions of the Law and repeal obsolete requirements of the Law. The International Union for the Protection of New Varieties of Plants (UPOV) suggests an eighteen-year protection period for woody plants. We are not required to change the period to 18 years to join the UPOV, but such a change would be consistent with UPOV if sometime in the future we provide for protection of woody plants in the United States(9) that are sexually reproduced.

EXPECTED BENEFITS OF PLANT VARIETY PROTECTION HAVE BEEN REALIZED

Expected benefits from the legislation were spelled out in the legislative history of the Plant Variety Protection Act.(10) They included (1) stimulation of private plant breeding; (2) enablement of government agriculture experimental stations to concentrate their efforts on basic research; (3) allowance for public expenditures for plant breeding in areas that industry might not be willing to pursue; (4) more choice of varieties for farmers; (5) increased competitiveness of American agricultural products in world markets; and (6) varieties of improved quality and improved methods of production. By and large, most of these benefits have been fulfilled by the legislation. For example, a 1976 survey established that since the passage of the Act, there has been a substantial increase in the number of private firms conducting research, an increased investment of private research funds in variety development, an increase of research investment as a percentage of sales, and a marked increase in the number of soybeans, cotton and wheat varieties.(11, 12) We believe that further fulfillment of these benefits will be aided by adoption of the amendment extending protection to okra, celery, peppers, tomatoes, carrots and cucumbers.

PATENTING OF PLANTS IS NOT NEW AND CONTROVERSIAL

A representative of the National Sharecroppers Fund (NSF) has stated: "The idea of patenting new inventions is an old one. Some European nations have had patenting laws several decades before Columbus raised his sails and headed west to America. But the notion that living things could—or should—be patentable is new and controversial. In the early 1960's, in order to protect their markets, French rose breeders pressed for laws allowing them to patent their roses. This quickly led to the first comprehensive system of plant patenting."(13)

This statement obviously refers to the controversy surrounding the question of whether a living microorganism is patentable. Arguments regarding this question were recenty heard by the United States Supreme Court.(14) However, the statement is irrelevant to the patenting of plants in the United States. The United States has had a Plant Patent Act since 1930.(15)

Congress concluded as far back as 1930 that plant breeders should be entitled to protection on their newly developed plant varieties, to which inventors of other types of inventions were then entitled. So contrary to the above statement, plants, with the exception of sexually reproduced plants and tuber-propagated plants, have been protectible in the United States for almost fifty years.

The Plant Patent Act has some limitations. It only offers protection for asexual reproduction of plants, for example by cuttings. Therefore, most of the plant patents issued in the United States are for ornamental varieties. This limitation was partially eliminated by passage of the Plant Variety Protection Act of 1970.

PLANT VARIETY PROTECTION DOES NOT RESULT IN GERM PLASM EXTINCTION AND/OR GENETIC UNIFORMITY

The most serious charge against the amendments and the Act itself is that such legislation causes extinction of varieties and will lead to genetic uniformity. Opponents of the amendments conclude that the amendments and the law will lead to such genetic uniformity. The American Patent Law Association reaches the opposite conclusion.

The conclusion that there is a cause-effect relationship between plant variety protection and the extinction of germ plasm and genetic uniformity is unsupported by facts or reason. Proponents of the genetic uniformity/germ plasm extinction argument have failed to distinguish two different types of activities: (1) decisions not to market or to discontinue marketing a variety because of its failure to satisfactorily perform in the marketplace; and (2) failure to preserve germ plasm.

The decision not to market or to discontinue to market a variety is based upon its performance and acceptance in the marketplace.

Farmers will purchase and grow out seed that performs best for them under conditions of their particular geographical location. (16) This necessarily will lead to a narrowing of those varieties that are marketed, but it does not follow from this fact that the Plant Variety Protection Act results in the extinction of germ plasm; nor does it follow that the Act does not promote diversification in germ plasm. (17) As a matter of fact, the Act promotes diversity in germ plasm by requiring distinctiveness in varieties. (18, 19)

The failure to market or the removal of a variety from the market does not lead to the extinction of germ plasm but the failure to preserve it does. The Plant Variety Protection Act helps preserve germ plasm because it is mandatory that a sample of any variety protected must be maintained in the Germ Plasm Preservation Center in Fort Collins, Colorado (20) whether or not marketed. Failure on the part of the Plant Variety Protection Certificate holder to comply with this part of the law can lead to premature expiration or invalidation of the Certificate. (21)

The preservation of germ plasm is a concern to both the private and public sectors and every effort should be made to try to ensure that preservation is maximized. (22) However, the loss of germ plasm cannot and should not be attributed to the existence of the Plant Variety Protection Act. The Act requires germ plasm preservation of protected varieties. In this regard it should be noted that samples of a variety covered by plant variety protection must be deposited in the Germ Plasm Preservation Center even if it is not being marketed. Also the loss of germ plasm was occurring long before the enactment of plant protection legislation.

In pointing to the dangers of genetic uniformity, the opponents of the Bill point to two crop disasters. The first was the Irish potato famine of 1845 to 1847 and the second was the hybrid corn blight of 1970. Since neither hybrid corn nor Irish potatoes are protectible under either the Plant Variety Protection Act or the Plant Patent Act, neither of those disasters can be blamed upon plant variety or plant patent protection.

THE PLANT VARIETY PROTECTION ACT DOES NOT ESTABLISH ILLEGAL VARIETIES

Some opponents of the amendments have stated that adoption of the amendments would lead to illegal varieties. These allegations are probably based upon the fact that in Europe each country has made it illegal to sell certain varieties. The reason that certain varieties have been made illegal is that it has been determined that these varieties will not perform adequately in a specific country. The list of illegal varieties may contain both protected and unprotected varieties.

There is nothing in either the Plant Variety Protection Act or in the amendments that would create so-called "illegal varieties." The United States Plant Variety Protection Act simply does not serve a regulatory function. The United States government does not get into the business of telling farmers what type of seed should be purchased. The United States utilizes a voluntary system of seed certification that ". . . is operated by independent crop improvement organizations or seed certifying agencies."(23)

Any fears that the Act can be used by a Plant Variety Certificate holder to create shortages in the food supply are unfounded. The Act provides specific protection against such action by allowing the Secretary of Agriculture to declare a protected variety open and available to the public if it is determined that such action "is necessary in order to ensure an adequate supply of fiber, food, or feed in this country and that the owner is unwilling or unable to supply the variety at a price which may reasonably be deemed to be fair."(24)

JOINING UPOV WILL NOT REQUIRE THAT THE UNITED STATES ADOPT EITHER THE EUROPEAN PLANT PROTECTION LAWS OR A SYSTEM LEADING TO ILLEGAL VARIETIES

The International Union for the Protection of New Varieties of Plants (UPOV) is an organization whose purpose is to (1) help protect both on a national and international basis plant breeders' rights and (2) establish procedures for granting plant variety rights to breeders.(25) The UPOV Convention provides reciprocal treatment. This means that the U.S. would provide a plant breeder from France with the same rights France grants to a United States citizen applying for French plant breeders' rights. The provision of reciprocity is inconsistent with the allegation that the United States would have to adopt the European system and its feature of illegal varieties to join UPOV.

It is in the interest of the United States to join UPOV, since it will help enhance protection of varieties developed by United States breeders in other countries that are members of the Convention. The Convention allows American breeders to establish priority rights in member countries if they file their application in those countries within a specified time of filing in the U.S.(26)

Opponents of the amendments have also stated that the Plant Variety Protection Act has resulted in a large scale takeover of American seed companies by foreign-based multinational companies. They further suggest that these takeovers will result in ". . . higher seed prices to American farmers . . . give large seed companies an advantage in the marketplace . . . and that there is a . . . legitimate reason to suspect that chemical companies will link chemical research to varieties that they are developing. . . . ."(27)

With respect to the allegation that the Plant Variety Protection Act has resulted in a large-scale takeover by multinational companies, we submit that the takeovers have resulted from other economic factors such as the decline of the U.S. dollar in the international market and U.S. tax laws.(28)

With respect to higher prices, NSF argues that patents give their holders a virtual monopoly and thereby allow them to force up prices artificially. The fact that a company has a large number of patents does not mean that the company controls the market. Prices are influenced by factors in the marketplace and other economic elements. More research has occurred because people providing the research capital can expect to recoup their expenses and make a reasonable return on their investment. As research expenditures are increased there will be an increase in the cost of seed. However, past experience shows that the cost of protected seed is not that much higher than unprotected seed.(29)

It has also been contended that the Plant Variety Protection Act only benefits large companies. This statement simply is not true. Patents and Plant Variety Certificates benefit individuals and small companies as well as large companies. The fact is that in many cases it is an individual or small company ownership of a patent or Plant Variety Certificate that allows them to compete with larger companies who have greater resources for marketing varieties. Furthermore, only twenty-seven percent of Plant Variety Certificates have been issued to seven of the largest seed companies with the rest going to smaller companies.(30)

The allegation that chemical companies would deliberately breed seeds that would require use of chemicals manufactured by that company is preposterous. There are many reasons that pharmaceutical and chemical manufacturers have acquired seed companies. Among these include the natural synergism between seed, chemical and biological research and the fact that the same channels of distribution can be used for agricultural chemicals and seeds. Proponents of the "chemical-seed conspiracy" deliberately overlook the fact that one of the primary goals of any well-run seed research program is to develop varieties exhibiting high disease and insect resistance.

OPPONENTS TO THE AMENDMENTS CONTAINED IN S. 1580 HAVE RESORTED TO A SKY-IS-FALLING ARGUMENT

The NSF and other opponents of the Bill have resorted to a "sky-is-falling" argument against the amendments. This argument contemplates that all types of disasters, real and unreal, will result from passage of the amendments. If all beneficial technology involving some controversy or risk was excluded from patent protection the United States public would have been largely deprived of the benefits arising from the use of medicine, petroleum, machinery products, etc. However, any risks due to the use of a particular technology exists independently of patent protection and the folly of excluding such technology from patent protection because of risks was succinctly set forth in an Amicus Brief in the case of *Diamond* v. *Chakrabarty*.(31)

It is submitted that the potential calamities alluded to by the opposition are, like those advanced by those opposed to patenting microorganisms, overstated.

PASSAGE OF S. 1580 WILL RESULT IN INCREASED INNOVATION IN PLANT BREEDING AND IS IN THE BEST INTERESTS OF THE UNITED STATES

Our patent laws have served us remarkably well for close to two hundred years. There has, however, been a marked reduction in U.S. innovation over the last decade or so.(32) Major attempts now through various bills introduced by Congressmen and through a bill introduced by President Carter(33) are being made to bolster up the patent system and return the United States the innovative leadership that it once enjoyed. Honest, but misguided attempts to stop amendments of the type being considered now would put a serious damper on the current efforts to improve innovation in the United States. For this reason the American Patent Law Association urges the Subcommittee to vote for passage of the amendments contained in S. 1580.(34)

FOOTNOTES

1. Plant Patent Act of 1930, 35 U.S.C. 161 et seq.

2. Plant Variety Protection Act of 1970, 7 U.S.C. 2321 et seq.

3. Plant Variety Protection Act, supra, note 2. Section 144 reads as follows: "The provisions of this Act shall not apply to the seeds, plants or transplants of okra, celery, peppers, tomatoes, carrots and cucumbers."

4. Plant Variety Protection Act, supra, note 2, preamble: "An Act to encourage the development of novel varieties of sexually reproduced plants and to make them available to the public, providing protection available to those who breed, develop, or discover them, and thereby promoting progress in agriculture in the public interest."

5. Survey conducted by the National Council of Commercial Plant Breeders conducted in 1976.

The results of the survey were summarized by the American Seed Trade Association in 1979 in response to questions raised by Congressman Udall about the effect of the Plant Variety Protection Act. Section I(1)(d) of that summary is as follows:

"d. The respondents were asked if the availability of plant variety protection had affected their investment in research. Thirteen responded that the availability of protection had no effect on their investment, eighteen indicated a moderate effect, and fourteen indicated a positive effect. In total, 71 percent of those responding replied that the availability of plant variety protection had had at least some positive effect on their investment in research."

6. Response of The American Seed Trade Association to an article by Don Kendall, Associated Press Farm Writer. The article appeared on a syndicated basis on September 7, 1979 (see The Farmers Forum of Fargo, North Dakota).

7. Proposed Issue Briefing Papers prepared by Bernard M. Leese, Commissioner of the Plant Variety Protection Office—sent to Steve Brattain, Department of State, on January 7, 1980, page 2; Paper entitled "Issues Concerning Amendments to the PVP—Identical Bills S. 23 and H.R. 2844."

8. American Horticulturist, Editorial by Dr. Gilbert S. Daniels, February/March issue, pp. 3–4.

9. Background statement on the Plant Variety Protection Act and Proposed Amendment to the Plant Variety Protection Act prepared by the American Seed Trade Association.

10. House Report No. 91-1605, 91st Congress, 2d Session (1970).

11. Survey conducted by the National Council of Commercial Breeders and summary results thereof by the American Seed Trade Association, supra, note 5.

Section I(1)(a), I(1)(b), I(1)(c) reads as follows:

"I. 1. The Effect of the 1970 Plant Protection Law on Plant Research—The best 'hard' information was obtained in a 1976 survey conducted by the National Council of Commercial Plant Breeders. The survey represented most of the organizations actively involved in plant variety development in the U.S. The survey was sent to sixty-one private plant breeders with about a 90% response. Some of the results of the survey are as follows:

"a. Of twenty-five firms conducting soybean research programs, only one was more than twelve years old. This is strong evidence that the commercial soybean breeding industry is a direct product of the Plant Variety Protection Act. Prior to 1970, breeding of new soybean varieties was conducted primarily by state and federal institutions. Plant Variety Protection certificates have been issued on 120 new soybean varieties, which is greatly in excess of new varieties developed during a similar period prior to enactment of the Plant Variety Protection Act. We do not say that all of these 120 new varieties will survive the tests of the marketplace. The important thing, however, is that the 1970 Plant Variety Protection legislation has resulted in soybean farmers having a greater choice of new and better varieties.

"b. Increased investment of private research funds in variety development since enactment of the PVP Act is indicated by questionnaire results showing that, using 1960 as a base year with a value of 100, investment in research increased in 1965 to 164, 1970 to 232, and 1976 to 712. These figures are strong evidence that the Plant Variety Protection Act has stimulated private investment in research.

"c. The survey showed research investment as a percentage of total sales, as follows: 1960—2.9 percent, 1965—3.6 percent, 1969—4.4 percent, and 1976—5.3 percent. These figures are significant because it places the research expenditures of the seed industry at a level exceeded only by that of very research intensive industries and well over that for many industries considered to be research oriented.

"3. Enactment of plant variety protection legislation not only increased the number of firms involved in breeding new varieties, but also resulted in those firms with already established breeding programs, primarily hybrid crops, expanding their research programs to include other crops. Of particular importance is that eighteen firms reported that soybeans were added to their breeding programs.

"Cotton is another crop in which the value of plant variety protection is evident. There has been a relatively large increase in the number of firms involved in cotton breeding research.

"The positive benefits of plant variety protection are evident by looking at the negative aspects as they apply to several of the excluded vegetable species. The American Seed Trade Association maintains a voluntary register of new vegetable varieties. In the case of cucumber, no open pollinated varieties have been listed since May of 1977, whereas, during the same period of time, nine hybrid varieties have been listed. In the case of tomato, five open pollinated varieties have been listed compared to nineteen hybrid varieties. For carrots, no open pollinated varieties are listed with four new hybrid varieties, and in the case of pepper, the ratio is two open pollinated varieties and three new hybrid varieties. Hybrids have inherent protection since they do not reproduce completely true from seed after the first generation. The lack of protection for open pollinated varieties of the six excluded vegetables is the direct cause of the direction of research toward development of hybrids. This situation will remain, or even increase, until protection is available for non-hybrid of these species."

12. Backgound statement on the Plant Variety Protection Act and Proposed Amendment to the Plant Variety Protection Act prepared by the American Seed Trade Association, supra, note 9, first page, last paragraph.

13. Hearings on H.R. 999 before the House Agricultural Subcommittee on Department Investigations, Oversight and Research, July 19, 1979 (Statement of Cary Fowler on behalf of the National Sharecroppers Fund).

14. *Diamond* v. *Chakrabarty*, Supreme Court Docket No. 79-136, heard March 17, 1980. The question involved in this case was whether a living microorganism was patentable subject matter.

15. The Patent Act of 1930, supra, note 1.

16. Response by the American Seed Trade Association to an article written by Don Kendall, Associated Press Farm Writer, supra, note 6.

17. Background paper by ASTA, supra, note 9, page 3.

18. The Plant Variety Protection Act of 1970, supra, note 2.

Section 41(a)(1) requires that a novel variety must be distinct. This section reads as follows:

"(1) Distinctness in the sense that the variety clearly differs by one or more identifiable morphological, physiological or other characteristics (which may include those evidenced by processing or product characteristics in the case of wheat) as to which a difference in genealogy may contribute evidence, from all prior varieties of public knowledge at the date of determination within the provisions of section 42."

19. Background paper by ASTA, supra, note 9, page 3: "All plant varieties are characterized by uniqueness. The importance of a variety lies in its being a pool of variations, gene pools, within its expressed characters. This is why it is important to encourage plant breeding by crossing material now in channels of commerce and with exotic material to increase diversity in our most advanced and diversified germplasm, our commerce varieties. To make a point, it has been determined by statistics that it is possible to obtain approximately 97 x 10^2 genetically distinct varieties from a cross of two varieties. In summary, the genetic pool of today's varieties is much greater than the genetic diversity of varieties in the past."

20. The Plant Variety Protection Act of 1970, supra, note 2, Section 52(3).

21. Plant Variety Protection Act, supra, note 2, Section 83(c): "The term of plant variety protection shall also expire if the owner fails to comply with regulations, in force at the time of certificating, relating to replenishing seed in a public repository. . . ."

Section 122(b): "The following shall be defenses in any action charging infringement and shall be pleaded: . . . (3) invalidity of the plant variety protection in suit for failure to comply with any requirement of section 52. . . ."

Section 52 requires an applicant to declare that he will deposit a viable sample of the seed needed to produce the variety in a public depository and that he will replenish the seed periodically.

Also, prior to issuance of a Plant Variety Certificate, the applicant is required to submit a sample of the seed needed to produce the variety to the USDA. Failure to provide the sample within three months of the request will result in the abandonment of the application (See Section 180.101(b), "Regulations and Rules of Practice" under the Plant Variety Protection Act, Chapter I, subchapter H, Part 180).

22. Samples of all seeds sent to the U.S.D.A. and the Patent and Trademark Office are maintained at the National Germ Plasm Center in Fort Collins, Colorado. In addition, the U.S.D.A. collects wild seeds and has regional centers in seven cities. Seeds are maintained in seven international repositories and the seed is made freely available to any country and breeder.

J. M. Pochlman, Breeding Field Crops, (2d ed. 1979) at 109-112.

23. Background paper prepared by the American Seed Trade Association, supra, note 9.

24. The Plant Variety Protection Act of 1970, Section 44.

25. UPOV Convention. This Convention was signed by the United States Department of State on October 23, 1978 at the Diplomatic Conference.

26. UPOV Convention, supra, note 23.

27. Hearings on H.R. 999, supra, note 12 (Statement of Cary Fowler on behalf of the National Sharecroppers Fund).

28. Response by the American Seed Trade Association to questions submitted by Representative Udall, supra, note 9, pp. 7-8.

29. Background paper prepared by the American Seed Trade Association, supra, note 9, pp. 7-8.

30. Citation showing distribution of Plant Variety Protection Certificates.

31. Amicus Curiae Brief on behalf of the Pharmaceutical Manufacturers Association (PMA) in response to arguments advanced in the Amicus Curiae Brief of the Peoples Business Commission (PBC), to the effect that providing patent protection for genetic engineering technology would lead to a multitude of calamities, pp. 15-20.

"c. The 'sky-is-falling' arguments made against the patenting of living organisms could have been made against a multitude of inanimate technologies which have contributed heavily to this country's progress.

"Amicus PBC, and to a lesser extent Petitioner, liberally engage in what had been called 'the doomsday scenarios of "creative pessimism."' PBC is concerned with the lack of proven safety of genetic engineering techniques and seeks to impose on the Patent and Trademark Office the obligation to protect the public interest in this regard. However, as will soon be made apparent, controversiality has absolutely nothing to do with patentability. There are many technologies whose promotion is unquestionably in the public interest notwithstanding the presence of some degree of controversiality or risk in their practice.

"In 1977, nearly 5,000 people in the United States died of poisoning from exposure to chemical substances varying from antibiotics to petroleum products, yet PBC does not suggest that patents should not be granted on these concededly valuable materials. Also in 1977, 1,643 people died in air and space transportation accidents, yet PBC does not suggest that invention in this area should be unpatentable. Forty-nine thousand five hundred and ten people died in motor vehicle accidents in 1977, yet innovation in the area of automobile transportation is a high priority in energy conservation. In short, arguments such as those here advanced by Petitioner and PBC predicated upon predicted calamities could have been advanced with equal force to arrest the development of any number of technologies, the overall social and economic value of which are now beyond question.

"Compared to almost any other object which starts with the letter D, DNA is very safe indeed. Far better to worry about daggers, or dynamite, or dogs, or dieldrin or dioxin, or drunken drivers, than to draw up Rube Goldberg schemes on how our laboratory-made DNA will lead to the extinction of the human race.

". . . Much of PBC's rhetoric is a veiled policy argument that a technology conceded to be capable of wide-spread beneficial application should, nonetheless, be excluded from the protection of the patent system in vindication of a perceived social or ethical need to regard 'aliveness' with an appropriate degree of awe and respect. A valuable lesson in this regard may be learned from the early experience with organic chemistry in which the very name of the field can be traced to the belief of Berzelius in 1807 that organic compounds could arise only through the operation of some 'vital force' within the living cell. While Berzelius' belief has since been shown to be unfounded, had that belief stood as a bar to patentability of inventions in the area of organic chemistry, the development of that extremely useful art would have been greatly impeded. . . ."

32. S. 1250, the National Technology Innovation Act of 1979 (introductory remarks of Senator Adlai Stevenson of Illinois).

33. H. R. 6933 introduced March 26, 1980 by Representatives Kastenmeier, Rodino and Railsback.

34. S. 1580 is vitually identical to H.R. 999, with differences occurring in Sections 15, 16 and 20 of S. 1580.

Sections 15 and 16 have merely been clarified and represent no substantive change.

In Section 20, the change consists of replacing the phrase "propagation prohibited" with the phrase "unauthorized seed multiplication prohibited." This change will simply clarify that unauthorized propagation is what is prohibited.

An additional amendment has been suggested in Section 42(a)(2) by the American Seed Trade Association with the concurrence of the Department of Agriculture. Section 42, as originally drafted, was patterned on 35 USC 102(d). The problem is that is establishes a statutory bar, even though a Plant Variety Certificate may not issue on the foreign application. This proposed amendment would replace Section 42(a)(2) with a bar that would result from the sale of seed in a foreign country more than four years before the effective date of the application. This type of provision would be consistent with provisions contained in the laws of many of the countries that are now members of UPOV.

American Patent Law Association,
Arlington, Va., July 3, 1980.

Re Senate bill 1580.

Hon. Donald W. Stewart,
Chairman, Subcommittee on Agricultural Research and General Legislation,
Russell Senate Office Building, Washington, D.C.

Dear Senator Stewart: On June 17, 1980, Mr. Sidney B. Williams, Jr. and I were scheduled to offer testimony on behalf of the American Patent Law Association on amendments to the Plant Variety Protection Act.

Just prior to the time for our testimony, the hearings came to an untimely end and were not reconvened until the next morning. Unfortunately, Mr. Williams and I could not return for the reconvened hearings, though we were afforded the opportunity to make a few comments for the record by Mr. Dale Stansbury. After we had made our comments, Mr. Stansbury asked that we reply in writing to questions that you advanced regarding the Plant Variety Protection Act.

The purpose of this letter is to reply to those questions. The questions and the American Patent Law Association's answers to them are attached. We hope that our answers resolve the questions that you have raised.

Sincerely,

Donald R. Dunner.

Enclosure.

[Response to questions proposed by Senator Stewart at the June 17, 1980, Senate Subcommittee on Agricultural Research and General Legislation hearings re proposed amendments to the Plant Variety Protection Act.]

Question 1. Could you explain for the Committee how plant patenting laws in Europe differ from those in the United States?

Answer 1. This question has two aspects to it. The first is: How do the formalities and substantive Plant Breeders laws of Europe differ from the Plant Variety Protection and Plant Patent Acts in the U.S.? The second has to do with whether or not there are any regulatory functions either in the patent laws or in laws administered by some other body.

The United States, unlike most countries in Europe, has two statutes that govern the protection of plants. The first is the Plant Patent Act of 1930, which provides protection for asexually produced plants, and the second is the Plant Variety Protection Act of 1970, which provides protection for plants produced by seed. In most of the European countries there are laws for the protection of seeds that are referred to as "plant breeders rights." From a substantive standpoint, protection provided by the U.S. plant breeders rights and those in European countries are virtually the same. The primary difference is that most of the European countries require "growout" trials. These trials are conducted by the governments to determine if the plants have the characteristics claimed by the owner of the variety for which protection is being sought. Growout trials are not required under the U.S. Plant Variety Protection law. The European plant breeders rights extend to all plants, whether or not they are produced asexually or by seed. In the U.S., the two different types of protection have different formal requirements and also different requirements for grants. Also, hybrids are protectible under the Plant Patent law but not under the Plant Variety Protection law. Tuber-propagated plants (Irish potatoes and Jerusalem artichokes) are excluded from plant patent protection.

The second part to this question, I believe, is more pertinent to the hearings on these amendments for the following reasons:

Opponents of the Amendments, and in fact of the Plant Variety Protection Act itself, state that the Act will lead to a European-type of regulatory syustem. What these opponents have done is to confuse the plant breeders rights of Europe with the merchandising regulations in Europe. In addition to having Plant Breeders Rights, most European countries have regulations that prohibit the merchandising of certain varieties. These prohibitions are based upon decisions that certain varieties will not perform in a specific country and are based upon tests conducted by the governments of those countries. Once it has been determined that certain varieties will not grow or perform in a certain country, they are put on an illegal variety list. These are referred to as the so-called "common catalog." It is illegal to sell these varieties. There is no such regulatory system in the U.S. Certainly, the Plant Variety Protection Act does not provide for such regulation. Enforcement of the Plant Variety Protection Act can only be by the owner of the Plant Variety Protection Certificate. Specifically, the only remedy for infringement of Plant Variety Protection Certificates is set forth in Section 121 of the Plant Variety Protection Act, which reads as follows: ". . . [a]n owner shall have remedy by civil action for infringement of his plant variety protection under Section 111."

If a variety is sold under the name of a variety shown in a certificate, there is a prima facie presumption that it is the same variety. There are no criminal sanctions in the Plant Variety Protection Act. Also, there is no regulatory scheme in the U.S. that makes the selling of any variety illegal. It should be pointed out, however, that there are voluntary certification agencies that certify that seeds meet certain standards. If seeds are advertised and sold as being certified, and in fact are not, criminal sanctions may apply. However, this is a violation of the Federal Seed Act based upon false advertising and misrepresentation. Seed may be certified whether or not it is protectible by plant variety protection. This is also true in Europe. A particular variety may be illegal in a country whether or not it is protected by plant breeders rights.

Question 2. Has anyone ever gone to court to sue for patenting rights?

Answer 2. Again, this question must be answered in two parts: The first as it relates to plant patents and the second as it relates to plant variety protection.

With respect to plant patents, there have been court cases decided. Two of the most recent are *Yoder Bros., Inc.* v. *California-Florida Plant Corp.*, 532 F.2d 1347, 193 USPQ 264 (5th Cir. 1976), and *Plan-American Plant Co.* v. *Andy Matsui, d.b.a. Andy Matsui Nursery,* which was decided in the U.S. District Court for the Northern District of California on July 12, 1977. In the *Yoder* case, the district court held that seven plant patents were valid and infringed. In the *Pan-American* case, the court held that the patents were valid but not infringed.

With respect to plant variety protection, there have been few cases filed. The only two suits of which APLA is aware were both filed by North American Plant Breeders (NAPB) of Mission, Kansas: *NAPB* v. *Greenway* (filed in Idaho) and *NAPB* v. *Haynes* (filed in Oregon). Both suits are still pending.

Question 3. What effect will including the U.S. in UPOV have on our patent law?

Answer 3. There will be no substantive effect. One of the primary purposes of UPOV is to harmonize on an international basis procedures for obtaining plant breeders rights. An example of the type of thing that could happen is the Plant Cooperation Treaty. Under the terms of the Plant Cooperation Treaty, members to the Treaty can file one application in a receiving office and indicate in what other countries it would like to have the application processed. This eliminates the need for a breeder or the owner of a variety to file separate applications in the various member states. However, the protectibility and the basis of protecting plants is based upon the national law of each country. There is no requirement that the laws of any country be changed to any particular uniform law. Therefore, UPOV will provide (1) opportunities for simplifying and harmonizing procedures for obtaining plant breeders rights in foreign countries and (2) an international forum for dealing with the problems and concerns of plant breeeders, farmers and the seed industry.

Question 4. Some concern has been expressed that the U.S. will end up with the system used in Europe where some varieties have been declared "illegal." Do you feel this can occur in the U.S.? If not, why not?

Answer 4. We do not feel that the creation of a list of illegal varieties will occur in the U.S. or can occur in the U.S., the primary reason being that this country just does not believe in the government telling plant breeders what varieties they can breed and sell. In this regard, we note the testimony of Herbert Mast, Vice Secretary-General of UPOV, before the House Agriculture Subcommittee on Department Investigations, Oversight and Research, on April 22, 1980. Mr. Mast told the Committee, which was considering amendments almost identical to those contained in S. 1580, the following:

"UPOV does not expect or demand national catalogue systems for plants. Such systems are completely outside the realm of UPOV, although some of UPOV's members have them. Article 14 of the UPOV Convention, in fact, states that breeders rights must be completely independent of any practices or measures for regulating the production, certification or marketing of seeds and propagating material. *Everybody in UPOV knows that the United States is opposed to such catalogue systems. The United States Delegation at the 1978 Diplomatic Conference to revise the UPOV Convention could not have been clearer on this point as I can witness as the Secretary-General of the Conference. The United States adamantly stated that it would not adopt any cataloguing system, no matter how useful it may be in Europe.* UPOV will not and cannot compel the United States to outlaw a single variety in the United States. We realize and accept the fact that in your country consumer demand, not government administrators, determines which varieties will be available." (Emphasis added.)

As pointed out above in discussing question number one, there are voluntary certification agencies in the U.S. There is no governmental agency that restricts the sale of any variety. Again, I would like to emphasize that the restricted variety lists that are developed in Europe are based on each individual country determining that certain varieties will not perform in the country.[1] It is also believed that such a system in the U.S. would not be practical because of size and climatic differences in various geographical areas. The only sanctions imposed by the government is that there cannot be false labelling or false selling of certified seed when it is in fact not certified seed.

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[1] The provision authorizing the establishment of illegal varieties may be either in the Plant Breeders rights law or may be part of another regulatory scheme. An example of a country having the provision in the Plant Breeders rights law is the Netherlands (see attachment—Netherlands Act containing New Regulations Government Plant Breeders Rights and the Trade in the Propagating Material of Agricultural and Horticultural Species (Seeds and Plant Materials Act) (October 6, 1966).)

This law applies whether or not a variety is a protected variety or a nonprotected variety. Since the voluntary method of seed certification has seemed to work, politically the government telling breeders and owners of varieties what varieties they could sell does not appear to be a viable or likely alternative.

[Attachment]

CHAPTER VI—COMMERCIALIZATION OF PROPAGATING MATERIAL AND TESTING INSTITUTIONS

PART I—COMMERCIALIZATION OF PROPAGATING MATERIAL

Section 80

(1) Without prejudice to the right to use a trade name or trade mark, propagating material of a variety entered in the Netherlands Register of Varieties shall not be commercialized, offered for sale and, subject to the provisions of paragraphs (2) and (3), exported, otherwise than under the denomination entered in the Register.

(2) If in any other country a name different from the one registered in this country should be prescribed for a certain variety, propagating material of that variety may only be exported to that country under the denomination adopted there.

(3) Unless paragraph (2) of this Section is applicable propagating material of a registered variety may be exported to States other than Member States of the Union under the denomination customarily used in the country of importation, provided the denomination used in this country is also stated.

(4) The denomination registered or a similar term shall not be used for other propagating material derived from the same or a related botanical species.

Section 81

(1) Of agricultural species only propagating material of registered varieties belonging to those species shall be commercialized, offered for sale and exported.

(2) It may be laid down by general administrative order that the preceding paragraph shall not apply to certain agricultural species.

(3) It may be laid down by general administrative order that only propagating material of registered varieties of horticultural species shall be commercialized, offered for sale and exported.

Section 82

Our Minister may, after having heard the committee on institution referred to in Section 73, decree that notwithstanding the provisions given by or in virtue of Section 81, propagating material of groups of plants to be designated by him that are not registered, may also be commercialized, offered for sale and exported.

Section 83

(1) It may be laid down by general administrative order that of an agricultural species to which paragraph (1) of Section 81 applies only propagating material of varieties appearing in the list of varieties or other groups of plants put on that list shall be commercialized, offered for sale and exported.

(2) Our Minister shall lay down regulations governing the commercialization and sale of the propagating material of societies and other groups entered in the "for export only" column.

Section 84

(1) What categories of propagating material of varieties belonging to an agricultural species designated in virtue of Section 87 may be commercialized, offered for sale and exported shall be laid down by or in virtue of a general administrative order.

(2) For plant breeding reasons it may be laid down by general administrative order that categories of propagating material of varieties belonging to botanical species designated by that order, as referred to in paragraph (1), the categories so being designated in that order, shall be produced and commercialized solely by the holder of the plant breeder's right for the variety concerned or, if there is no plant breeder's right for that variety, by the conservers designated for the variety.

(3) The conservers shall be designated by the Board. The Board shall designate a single conserver if this is necessary for plant breeding reasons. The latter shall be obliged to make foundations stock suitable for the production of propagating material available to persons who have expressed a wish to receive it, on terms and conditions to be laid down by the Board.

Section 85

Propagating material of a variety registered in virture of paragraph (2) of Section 18 shall be commercialized, offered for sale or exported only by the breeder of the variety and by the person who has obtained from the breeder foundation stock suitable for the production of propagating material.

Section 86

Propagating material of a group of plants the commercialization of which is prohibited under the provisions of the preceding Sections may nevertheless for purposes of testing be commercialized and exported by or on behalf of the person who by his own efforts has developed the group of plants to which the propagating material belongs, provided the testing institution designated in virtue of Section 87 has given permission.

PART II—TESTING INSTITUTIONS

Section 87

(1) It may be laid down by general administrative order that only persons who are members of a testing institution designated for a certain botanical species in that order shall be permitted to engage in the production, storage and processing for business purposes other than for use in the plant breeder's own nursery, and the commercialization, sale, importation, exportation and offering for export of propagating material of that species, or to have these activities performed for business purposes.

(2) It may be laid down by the general administrative order referred to in the preceding paragraph that for the purposes of that order seed not intended to be sown for cultivation of crops shall also be regarded as propagating material.

(3) Our Minister shall have the power to grant dispensation or exemption from the provisions of paragraph (1) in such cases or groups of cases as he may determine.

STATEMENT OF DAN McCURRY, CONSUMERS FEDERATION OF AMERICA

I am Dan McCurry, a director of Consumers Federation of America, the nation's largest consumer organization, and coordinator of the Consumers Coalition of Chicago where I make my home.

Consumers are increasingly alarmed about the genetic weaknesses in our food supply. We see these amendments to the Plant Varieties Protection Act as endangering the strength of our domestic food system. We see this bill as benefiting only a few of the major seed corporations—who are so rapidly running our small seed businessmen out of business—that they already have a monopoly in many sectors of the seed industry. We see this bill as pulling the United States into an international seed patenting organization whose goals have been sharply criticized by some of the most renowned scientists and plant breeders in the scientific community. And pulling us into this international organization, thru the back door, without the full public discussion which is needed.

Administrator Schlei speaks of this bill as a simple bit of housekeeping legislation. If so, then the house is in bad repair.

S. 23 is fiscally irresponsible. It perpetuates a growing and unnecessary drain on the public purse. Ten years ago, industry was promoting passage of the Plant Varieties Protection Act under the banner of responsible fiscal policy. ASTA contended that over 60 percent of the funds to run this office could come from the fees paid by those seeking patents. That 60:40 split was the rule at the Department of Commerce's Patenting Office and would be appropriate with PVPA also.

What do we have today? Section 31 of Section 10 of this bill continues to legitimize a deep dip into the public treasury for an office which was supposed to be nearly self-sufficient. Despite its well-publicized computer system, the staff continues to grow. And the fees? They are surely less than 5 percent of the total operating budget of PVPA.

A housekeeping bill, Mr. Chairman? What was promised to get the bill passed has now been swept under the rug. I would not expect that industry would propose a scale of graduated fees so that larger multinational firms pay more and smaller firms pay less. I would not expect the seed industry to renew its support of the idea that fees should be 60 percent of the PVPO budget. I would have hoped to hear a word about the budget for this bill from the Department of Agriculture.

Consumers Federation opposes this bill because it represents an increasing drain on the farm economy. Had the witness list not been closed, a representative of the National Farmers Union was prepared to testify here today. NFU research, reported in the House hearings, shows that seed costs over the past decade have been the most rapidly rising costs of all farm inputs.

Farmers asked the Department of Agriculture to study patents and these rising seed costs and if they were related to the increasing concentration of seed corporations. The Department, months later, has yet to move on that request. Indeed, when President Carter recently called farm input manufacturers up to the White House and requested that they hold down price increases, he neglected to call the seed industry. It is unclear why this Administration is so purposively overlooking the impact of the seed industry on the farm economy. It is another question which they want to sweep under the rug.

I would hope that this committee would request that the Office of Management and Budget would look at these PVPO budgetary expenditures with the same hard eye with which they look at other agricultural programs.

After ten years operation, the public is entitled to some justification for this program's existence. What impact has PVPA had on the larger number of Alabama soybean producers who must buy skys-the-limit soybean seed? How are farmer's suffering from disasters created by genetically weak seed being promoted in an area until that type of seed has a monopoly in the fields?

Each year taxpayers pay millions of dollars to assist farmers facing disasters due to blight, rust, mildew, drought, or flooded fields. How much of these losses are in areas where one or two companies promoting a few varieties of patented seed have gained a monopoly in that seed—a seed not tough enough to endure the climate? Will a brief overview show that in states where a few seed companies have a monopoly in a particular seed also be the states where disasters hit? I believe they will. Yet USDA refuses to consider these questions—and taxpayers continue to pay, farmers continue to suffer, and the patent seed industry continues to make record-breaking profits.

Tomato blights regularly and effectively destroy large portions of the nation's tomato crop. Does the Department of Agriculture's impact statement even ask the question if this legislation will strengthen or weaken the tomato industry, the tomato farmer, the tomato consumer? Of course not, these are only housekeeping amendments!

These amendments conceal several important changes proposed by the Agricultural Marketing Service. In Sections 4, 8, and 9 the Department proposes changing the word "specifications" to the word, "descriptions." This change is very deceptive and weakens the original intent of the Congress in drafting the legislation.

The USDA contends that "the terminology 'descriptions' is more appropriate for the measure of physical characteristics of plants." You would think this is hardly a major change. Well not hardly!

"Specifications" means exactly what it says, the "specifics" of a new variety. It is the common usage in all patent law where it is not enough to just describe a patentable object, you have to relate what it does. "Description" allows the department to approve a plant for patenting just by knowing what it looks like.

And looks, Mr. Chairman, are deceiving, especially deceiving with plant patents!

No two plants are exactly alike. And when they breed their offspring will also change. Some of those changes will, over time, make the offspring of a plant more toxic or poisonous than its parent, and will change the nutritional level in the produce from the plant.

Two years after the adoption of the PVPA, the Food and Drug Administration announced its concern over a number of these patentable varieties. FDA proposed some simple guidelines: (a) when a plant, thru interbreeding, suffered a 20 percent decrease in its nutrient content or a 10 percent increase in its toxic substances, the FDA wanted the seed industry to report that. (b) Then they would monitor any crop which provided only 5 percent of the national intake of some major nutrient.

If the public was depending on a certain vegetable to fulfill certain vitamin needs or if the public was consuming increasing quantities of a vegetable which, thru breeding, was becoming more toxic, then FDA contended, the public should know this. Tomatoes and carrots, two of the vegetables to be included under patent protection, were on the FDA list.

The soup industry supported this proposed monitoring. The seed industry was in strong opposition and, in time, the FDA backed off.

Consumers Federation urges the Department of Agriculture to include the "specification" of nutrient content and toxic content in the requirements for any patent approved. This will not be possible with this wording change.

Likewise, Mr. Chairman, the work of Dr. Michael J. Plewa of the University of Illinois Institute for Environmental Studies has warned us that the pesticides we spray on plants is changing their very genetic structure. These herbicides cause mutations in the food chain which will still be present long after the pesticides are gone. And some of these mutations, the Institute believes, are already producing cancers in humans as well.

What happens to a new variety when subject to a range of powerful pesticides? How will those changes impact the human body? If a patent is a license to produce for a limited number of years, should we not also include in that license a test to see what harm, what impact, it will have before that patent is granted?

The possibility of just such "specifications" will be removed if we approve this change of wording.

The Department of Agriculture has earned a great respect for its ability to prevent poisonous seeds from reaching the public, and noxious weeds from ravaging our farmland. Yet it absolutely refuses to study the benefits which would come from requiring such information from seed patent applicants.

CFA opposes this legislation because we see it directly encouraging the conditions which sell our seed industry into foreign hands. Over a year past, we asked the Department to study why the seed industry was becoming increasingly concentrated and more and more major U.S. seed firms were passing into foreign ownership? Again, the Department refuses to acknowledge this problem.

I did my own survey of seed industry annual reports however and discovered that many of the major seed firms are rolling in cash. With high profit margins and a supply of ready cash, these industries were very attractive targets for larger foreign firms. This was especially true of European firms who had experience with the protections of a plant patenting system.

Several European firms, are presently in this country buying up U.S. seed companies with an eye to the same high profits to which they have become accustomed in Europe. Since the passage of our Plant Varieties Protection Act of 1970, we have seen some of our largest seed firms go to European ownership. Firms such as Funk Seeds, now Ciba-Geigy of Switzerland; Agripro now Royal Dutch Shell; Jacques Seeds now Rorer-Amehem, and the list could continue.

Mr. Chairman, this Congress saw the danger of foreign corporations buying up the wealth of our farmland. And the Congress moved to demand a regular listing of such firms and their holdings. Many states passed even stronger laws against foreign ownership of farm land. But the land remains barren without the seed.

The public, and the Congress, have yet to become aware of the large segments of our seed industry that are now under foreign ownership. Recently, Sandoz, a large Swiss petrochemical firm, purchased the major farm seed firm, Northrup-King. This was the largest single foreign investment in the U.S. for that year.

More are to come, Mr. Chairman, many are already here. A look at the membership of the major proponents of this legislation, the American Seed Trade Association, would reveal how much of their true ownership is no longer American.

Before passage of this legislation, this Committee should request the Department of Agriculture to reveal the true ownership of all those corporations who have received patents since 1970, and in what varieties.

Mr. Chairman, the Department supports these amendments as they would "facilitate foreign trade." How can they make their case without also showing how many of the profits from the seed trade in the U.S. are already flowing across the ocean to their true foreign owners? Just this year another large seed firm, Coker, which does considerable business in Alabama, was made the property of a German corporation, Kleinwanzieberer Swatzucht Ag.

We are eager to protect the seed patents, the plant property rights of seed firms, but have no problems at all when the seed companies themselves become the property of foreign firms or large multinational corporations. How do we patent a small seed businessman to give him protection in his trade? How do we patent the rights of a consumer to a dependable food supply?

Several years ago, Mr. Burpee of Burpee Seed Company offered a prize for anyone breeding a special variety of flowers. Consumers and home gardners eagerly responded. Before long, Burpee had received this flower and was marketing it. The consuming public cooperated because Burpee had produced many useful varieties of fruit, flowers and vegetables for their gardens and tables. A confidence had grown thru the years.

But now Mr. Burpee is no longer the owner. Burpee Seed is the property of International Telephone and Telegraph (ITT.) And ITT, Mr. Chairman, has been substituting wood chips in place of farm grown wheat flour in its bread. Will consumers place the confidence in ITT they once held for Burpee? It is not likely. And what is to stop ITT, in the name of higher profits, from diluting the strength of its Burpee seeds, in the same way that it has diluted the taste of its bread? Nothing at all.

Under the proposed amendments to the PVPA, once Burpee receives a patent for its tomatoes, carrots or peas, the public will have lost the opportunity of knowing the nutritional content, the toxic levels of those seeds. And like the chemical dumps we now discover polluting and poisoning the landscape, the dangers in seeds will be discovered after the damage is done.

In Sections 11, and 14, the USDA specifically asks for changes in the law to bring our statutes into conformity with the requirements of the International Union for the Protection of New Plant Varieties (UPOV.) The administration wants to join UPOV despite the strenuous objections of some of our most imminent American plant breeders. Despite the objections of Dr. Norman Borlaug, the Nobel Prize winning "father of the green revolution." Despite the opposition of the major center for global germplasm research, CIMMYT. I submit for the record, a letter of Dr. Edwin Wellhausen, the founder of CIMMYT, in which he expresses that opposition. Despite the strenuous warnings on the global plant patenting campaign, expressed by the United Nation's Food and Agricultural Organization. Despite the concerns of imminent scientists from major universities, some of whom have written to this committee.

Rejecting numerous case histories where plant patenting has prevented the free exchange of germ plasm around the world, the USDA not only continues to promote plant patenting in other countries now debating just such laws, but it also continues to reject even doing a study on possible relationships between plant patenting and the global exchange of seeds and germ plasm. Again I must ask that before the Congress continues on this legislative route, it should request the USDA to prepare a true impact analysis on the PVPA for the past decade. And to present the Senate with a thorough analysis of the benefits to be gained in joining UPOV before such action is taken.

The impact statement with S. 23 should be rejected by this Committee, and the Administration requested to return with a full economic analysis of this bill. "These proposed changes will affect less than 200 persons or firms that breed new crop varieties" the Department contends. How about the thousands of farmers who grow these six vegetables? And the millions of consumers who depend on these six for a significant portion of their daily nutrition? They are not to be considered. This is, after all, only a housekeeping resolution.

In 1968, consumers applauded the strong stand against Plant Varieties legislation taken by Secretary of Agriculture Orville Freeman. Fortunately, the Secretary then was a bit more concerned than the present administrators in Agriculture. And he posed, to this Senate, at least a dozen questions whose answers, for him, lead him to fight Plant Varieties Protection Act. In reviewing, the impact analysis submitted with S. 23, I find that not a single one of Secretary Freeman's questions was given even the consideration of a denial.

Those questions were sufficiently strong in the minds of the Senate Agriculture Committee then to cause them also to reject Plant Patenting legislation. This committee should not accept any impact statement which does not treat seriously with those same questions again.

Finally, Senator, consumers Federation is opposed to this legislation due to the less than open manner in which it was presented to this Congress. The USDA contends that "public comment was not obtained in the development of this legislative proposal as it will be offered during the Congressional hearing process." Does the Department contend that this legislation was drafted and presented with the American Seed Trade Association knowing nothing of its contents before it was published? Does the Department contend that the industry did not see drafts and make comments on this legislation even before it reached the Secretary?

That would be most unlikely. In the 1970 passage of this Act, the seed industry described with pride the long process of drafting which they created in order to write the very bill which was presented by the Department of Agriculture. Was this bill really that different?

No, Senator Stewart, the only public that wasn't asked for comment before this bill was drafted, was that public who were opposed to this legislation. From Secretary Freeman, to Dr. Borlauge the opposition was carefully ignored. And we are grateful for your decision to give this bill the full attention which it deserves.

Speaking before the American Seed Trade Association's 1978 annual meeting, administrator Schlei responded to cries of governmental over regulation with her own belief that "we should not continue to fund programs that we cannot afford." There is strong reason to believe that the PVPA and S. 23 is just one of those activities that we "cannot afford."

For over a year now, opponents of this legislation have requested the Department to persue the studies which would show its true impact on the economy. And in the name of a "housekeeping bill" these concerns have been consistently swept under the rug.

This Committee has heard again today requests for just a solid informational base on which to make this policy decision. Without those studies, we will continue this dirty housekeeping.

Mr. Chairman, Consumers Federation trusts that you will let the Department of Agriculture know that housekeeping also means housecleaning. And that much more work must be done before the Senate can debate this legislation.

The Board of Directors of the Consumer Federation's several million members is meeting today in Washington to reaffirm our support of just these efforts.

STATEMENT OF GINGER NELSON, NATIONAL CENTER FOR APPROPRIATE TECHNOLOGY, BUTTE, MONT.

I am pleased to have the opportunity to speak before you today regarding the proposed amendments to the Plant Variety Protection Act.

The National Center for Appropriate Technology (NCAT), is a non-profit corporation with its headquarters in Butte, Montana. It was established three years ago through a grant from the Community Service Administration to develop and apply appropriate community-based technology to meet the specific needs of low-income people and to promote locally-based programs that develop individual-based and community-based self-reliance.

Our Agriculture program includes the study and promotion of attached solar greenhouses to be used as additional heat sources for the home, as well as a tool to allow access to nutritious fresh vegetables year round. WE are also doing work with cold frames to extend the growing season, bed-depth studies on various home-grown varieties, studies of biological pest management, organic methods of growing and alternative farmer to consumer marketing systems.

We are concerned with many of the facets involved with the issue of plant patenting. These include the potential crisis of genetic uniformity and disease vulnerability, enforcement procedures and their effects (including the loss of local germplasm resources), and the philosophical implications of private ownership of genetic plant material that was virtually imported to this country to begin with and which was essentially developed to its current state over generations of improvements made by independent farmers and public research.

Because of NCAT's mission to help create a balance between people and their environment and to the promotion of self-reliance and self-sufficiency among the poor, I plan to focus primarily on the issues of the rights of individual farmers and gardeners to access and control over their source of supply, their right to have input into the direction of research, the potential increase in the cost of seed produced by private interests, the rights of consumers to a quality product, and the need for further study by the Department of Agriculture or another Agency, on the whole issue.

ACCESS TO SEED/DIRECTION OF RESEARCH

The whole philosophy behind the appropriate technology movement can be summed up in the words of E. F. Schumacher, in his book "Small is Beautiful": "Technology of production by the masses, making use of the best modern knowledge and experience conducive to decentralization, compatible with the laws of ecology, gentle in its use of scarce resources, and designed to serve the human person instead of making him the servant of machines."

The emphasis here is on decentralization of control and access to the necessities of life. This concept necessarily is in conflict with the consolidation of seed companies by large corporations within the past few years. This rapid consolidation has largely gone unnoticed and began shortly after the Plant Protection Act was passed. Studies have not been done to see what relationship there is between the passage of the act and the interest in purchasing seed companies by large corporations.

We have many concerns over the direction of research under large private corporations. The research efforts in the United States should be towards developing plants that are more pest resistant and hearty, and require less additional fertilizers and nutrients to be added to the soil. There is concern that a corporation dealing in fungicides or pesticides might have a subtle bias against problems that perhaps they don't even perceive, if they have a product that deals with the control of that problem sitting on the shelf. There are also instances in Europe, for example Lutin Wheat, which is being offered as a packaged deal, seed, and pest control chemicals together, all in one package. There is concern here over the potential of increased expense to the farmer as well as that of increased use of pesticides.

As private industry takes over the public loses control over the direction of research. Companies will have a tendency to do what is best for the company rather than what is best for the farmer or gardener. The real profits seem to be in the area of hybrids, which are not covered by the Act, but are profitable to large companies because the farmer or gardener must return yearly to purchase additional seed. With standard (non-hybrid) seed, he can save the seed to use the following year. As an example of the access to seeds problem, it is reported that Burpee Seeds, in a case where they had been offering two varieties of standard corn for the home gardener, offered in 1979, two hybrid varieties and suggested that they be used instead, even though the patent protection is offered for the open pollinated variety. (Article by Jennifer Bennett; Harrowsmith, Vol. IV, No. 2, Sept. 1979)

COST OF SEED

Since the original Act in 1970, seed has been the fastest rising farm price. The National Science Foundation has done a study that shows that before 1970, prices had followed crop prices. Now, there is no relationship; the Department of Agriculture has done no study to see why this is so. In the case related above, of the switch in varieties of corn offered by Burpee for similar crops from the standard seed to the hybrid seed, the hybrid seed was 50 percent more expensive that the standard seed they had offered before.

RIGHTS OF CONSUMERS TO A QUALITY PRODUCT

There is little to indicate that the patenting of varieties has had an effect on producing a higher quality of food for the consumer. Today, even within the area of public research, plant breeding has had a tendency to create varieties which are of greatest value to commercial interests. With tomatoes, for instance, we already have a situation where emphasis has been on varieties which have thick skins (they stand up to transport over long distances) and which are particularly susceptible to ethelene gassing (to get a ripe looking immature product). These "red rocks" as I love to call them, bear little resemblance to the tomatoes out of our own gardens or those usually grown locally.

There needs to be more research into the areas that should concern consumers most—having quality products, high in nutritional value at the time of sale and as pest resistent as possible. "A patent doesn't mean it's good", says Charles Phillips of Seeds Canada. "It just means it's different." (P.R. Mooney, Seeds of the Earth, pp. 73)

FURTHER STUDY NEEDED BY USDA

Before 1970, during the Johnson Administration, the USDA stance on this issue was against the patenting of seeds. In 1968, Secretary of Agriculture, Orville L. Freeman voiced concern over the issue and argued that any restrictions to the exchange of germplasm would have hindered the development of U.S. agriculture. Even so, the Plant Variety Protection Act was hurriedly passed by Congress in 1970. And, since that time, the effects of this legislation remains an unknown.

The Department of Agriculture has not:

Examined the relationship between the Plant Variety Protection Act and the takeover of the seed companies by multinational corporations.

Examined the effects on seed prices and industry consolidation.

Examined the vulnerability of our tendency to breed uniform varieties and their use world-wide.

This is an issue which should have been included and considered in Secretary Bergland's structure project. To my knowledge, his national dialogue on farm structure, which included wide-ranging, informed discussion of our agriculture options, did not include a look at this issue as an "emerging issue affecting structure." Farmers and the environmental community need to discuss the large-scale changes taking place in the seed industry and at least open a discussion on whether this is good or bad—or a neutral policy. The recently released report "Overcoming World Hunger—The Challenge Ahead," prepared by the Presidential Commission on World Hunger, urges great caution on the issue of plant patenting and reiterates the need for long-range studies to be done. They go on to warn about the "potential that narrow economic self-interests will be determining the fate of humankind's common heritage—agricultural diversity".

Small farmers, low-income people, and consumers in general cannot bear an increase in price and control over this very basis of our food delivery system. Most of this research belongs in the public domain where the cost of seed development is borne by everyone benefiting from its advancement; where concern for the consumer's needs for a quality, tasteful, and nutritious vegetable is of utmost importance, and where we do not let ourselves believe that we can rely more and more on corporate interests to be responsible for developing and maintaining a system of agriculture that is in the long-term best interest of this country as well as maintaining the ecological balance of plant varieties throughout the world. (See attached statement from A Regional Catholic Bishops' Statement on Land Issues, 1980.)

As a society we have to pay for plant breeding and seed either directly or indirectly. Whether we end up paying corporate breeders will be determined by the wisdom of those who fund government breeding programs and who create legislation that affects one of the most fundamental facets of food production in the United States. This issue will help shape the future of agriculture in this country and around the world and it deserves much closer examination.

These bills should not be passed. A study should be done prior to any actions being taken. There needs to be a response to the questions being increasingly raised before we chart a course which includes issues of such magnitude.

PLANT VARIETY PROTECTION ACT—HIGHLIGHTS OF THREE STUDIES

The Presidential Commission on World Hunger has recently released their report "Overcoming World Hunger—The Challenge Ahead," March 1980.

"Congress is currently considering legislation which would among other things, allow the U.S. to join an international agency dominated by European governments and established to promote and standardize these laws worldwide. *At the very least, there should be a thorough and careful review of this proposed legislation and all related laws currently on the books.* Establishing laws to patent forms of life raises serious ethical questions and may establish dangerous precedents. Appropriate federal agencies should be directed to do long-range reviews of these laws in light of world food security, conservation, and diversity. Appropriate policies and legislation remedies would hopefully follow.

"Closely interrelated with patenting laws are distressing trends within the seed industry. Patenting laws, strongly supported by some large seed companies, have encouraged concentration within the industry. The number of seed company takeovers, particularly by large pesticide, fertilizer, and drug companies, has increased dramatically over the last few years. *This could lead to olgopoly pricing and the potential that narrow economic self-interests will be determining the fate of human-kind's common heritage—agriculture diversity.*" (Emphasis added.)

President Johnson appointed a Commission to review the U.S. Patent System in July of 1965. Of the 35 recommendations presented in November, 1966, Recommendation IV dealt with plant patents:

"All provisions in the patent statute for plant patents shall be deleted, and another form of protection provided." The reason given by the President's Commission, was that it did "not consider the patent system the proper vehicle for the protection of such subject matter," and urged further study to determine the most appropriate means of protection.

A 1972 panel appointed by the National Academy of Sciences urged, "The long-range effect of the Variety Protection Act on germ plasm development, preservation, and exchange should studied." Put more bluntly, the study said:

"The law infrequently outruns biology; thus federal regulations in Canada designed to promote uniform wheat quality imposed stringent requirements on development of new wheat varieties in that country. The indirect effect of this legislation has been to narrow the germ plasm base and increase potential vulnerability of Canadian Wheat. A similar effect has developed from the enforcement of a one-variety cotton law in the San Joaquin valley of California and, more generally, from the recently enacted Federal Plant Variety Protection Law."

Statement of Walter F. Sullivan, Bishop of Richmond, Prepared by Patrick J. Ronan, Director, Office of Appalachian Ministry of the Catholic Diocese of Richmond

This testimony is submitted to express concern over S. 23, an amendment to the Plant Variety Protection Act (PVPA) of 1970. As we understand it, the amendment would:

1. Remove the exemption on patenting varieties of tomatoes, peppers, carrots, cucumbers, okra, and celery, and;
2. Extend protection of patents from 17 to 18 years, consistent with the regulations of the International Union for the Protection of New Varieties of Plants (UPOV), an association of Common Market countries which coordinates patenting laws and seed commerce in Europe.

We present our testimony based on our research into the history of this issue, on our discussions with persons involved, and on our perspective that ". . . we must preserve for ourselves and for future generations the genetic variety of plants necessary to protect humanity . . ." [1]

We believe that this legislation involves more than the six so-called "soup vegetables"—it is not as insignificant and isolated an issue as proponents such as the seed industry's American Seed Trade Association (ASTA) and the United States Department of Agriculture (USDA) would have us believe. There is a very important principle involved: all people have the right to food in order to sustain life and anything which threatens the genetic diversity of seed crops also ultimately threatens the continued availability of food to all. The apparent 'rush' of USDA and ASTA to pass these amendments, the fact that this reflects a reversal of USDA's 1968 position against plant patenting, and the lack of public participation in an ill-publicized hearing in July of 1979 give us sufficient cause to raise some questions and to request some time for study which can then form the basis for sound, far-sighted decisions.

LOSS OF GENETIC DIVERSITY

The ASTA and the USDA appear to be the chief proponents of this legislation. They would have us believe that there is no relationship between the loss of genetic diversity of germ plasm resources and plant patenting legislation. However, there is an impressive number of scientists and scientific organizations who believe that there is a relationship, a connection between loss of diversity and patenting of plants. These include: the National Academy of Sciences in "Genetic Vulnerability of Major Crops," 1972, and more recently in "Conservation of Germ Plasm Resources: An Imperative"; the United Nations' Food and Agriculture Organization in a February 1980 policy memorandum and in other sources; the Natural Resources Agency of the State of California in a position taken on May 2, 1980; and scientists at the Universities of Illinois, Massachusetts, Arizona, Harvard, and Oxford, England, to name a few. We must join those who voice concern at this time over this issue and its relatedness to other issues.

It is a widely-accepted scientific fact that genetic diversity of food crops is vital to a permanent and sustainable agriculture. It is this diversity which enables a species of food crop to survive despite insect problems, disease problems, and even regional or special climatic problems.

We believe that there is sufficient cause to be concerned that plant patenting has been one very real factor which has served to reduce diversity in European crops since its enactment initially in France in the early 1960's, and in American crops in the past decade. Patenting even serves to dictate genetic uniformity from the point of view that certification and enforcement of patent rights requires uniformity for administrative purposes at the very least—how can a patent be granted if a variety is not uniform to the point of consistent identification?

Proponents of this legislation have argued that the number of new varieties has increased since 1970 and, therefore, diversity has increased. However, as we understand it, two important factors are not considered in this argument:

1. Increase purely in the number of varieties does not automatically reflect an increase in diversity; judgment for assessing diversity depends not on numbers of varieties but on the genetic differences between varieties;
2. The National Academy of Sciences reports that "new varieties" are often not new at all: "Most [of the roughly 500 new cultivars offered annually] represent minor genetic advances and 'fine-tuned' adjustment to changes in production, harvesting, processing, and marketing procedures." In fact, in the case of tomatoes, for example, the introduction of new varieties in the last decade has actually caused the genetic resource base of this crop to diminish.

EFFECTS ON WORLD AGRICULTURE

U.S. activities in agriculture, especially in seed production and marketing are not without their effect on world agriculture. In the wake of crop failure in the U.S., we have historically turned to Third World or developing countries as reservoirs of natural genetic diversity or "gene centers." We concur with numerous reputable sources in their belief that these centers are threatened as multinational corporations (which have taken over small seed companies at an alarming rate in the past decade) exploit them and encourage discontinuation and thus extinction of old or native varieties for so-called "better varieties." A seed that is touted as "better" is often the product of very skillful advertising in a Third World country coupled with blatant ignorance of particular growing conditions, or of the impact of the loss of a native variety's 10,000-year history of evolutionary adaptation. In recent years reports have come to light which reveal this kind of irresponsibility [whether intentional or not] to be an all-too-common sales practice of multinational corporations which are virtually unaccountable for their activities. The improper promotion and use of Nestle infant formula (resulting in infant malnutrition and death) and the free distribution of the Dalcon shield, a contraceptive device, (resulting in uterine mutilation and sterility) in developing countries are but two heinous examples of this.

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[1] From the Heartland Bishops' Pastoral Statement on Land Issues, "Strangers and Guests."

This kind of irresponsible, short-sighted business practice is a serious threat to agriculture in these gene centers and indeed in the world. If this legislation purports to facilitate U.S. entry into this kind of seed commerce, we must register our objection to it.

Further, we cannot rightfully ignore the European experience with this type of legislation nor debates which are underway in Canada, Ireland, Australia, and Brazil. We must not seek false security in isolationism. A country as blessed with natural resources as ours has an equal measure of serious responsibilities to the rest of the world and also has effects on other countries which we sometimes fail to recognize. We live today in a world in which interrelatedness and the need for interdependence manifest themselves more and more.

SEED/FOOD CROPS UNLIKE "A BETTER MOUSETRAP"

It is our firm conviction that seeds, food crops, and genetic material (germ plasm) resources are a public trust and as such are given for the use and benefit of all. No one company, agency, organization, or individual can appropriately control seeds or food crops. Input into decisions affecting food quality, food prices and availability must come from a broad base of open and public involvement. A business orientation alone is not a sufficiently balanced perspective in the case of food crops since the right to food is a basic human right contingent on human need and not economics alone.

It is our further belief that the question of "absolute property rights" is inappropriate to these issues. We agree certainly that a breeder of plants is entitled to a reasonable return for investment of research monies, time, etc., but there are other ways for assuring a plant breeder of this right which need to be explored, e.g., tax incentives, grants, etc.

The absolutely essential nature of food to life removes plants and seeds from the realm of patentable objects whose patents can be bought, sold, and restricted in their distribution.

As the above testimony indicates, Bishop Walter F. Sullivan is deeply concerned about current trends in seed control which may threaten the basic right of people to food, to a sustainable agriculture, and perhaps ultimately to life. He concurs with his brother Bishops of the forty-four Dioceses in the Heartland who spoke aptly in their 1980 pastoral statement on land issues, "Strangers and Guests":

". . . stewardship of the land and life itself are both symbolically and naturally joined in the life-generating capacity of the seed. We must preserve for ourselves and for future generations the genetic variety of plants necessary to protect humanity. The control of seeds, because it also implies the control of food production and indeed of life itself, should not be appropriated to itself by any company or nation. We therefore urge a careful review of present and pending seed patent legislation."

In light of these issues, we urge non-passage of Senate Bill 23 and opposition to any further plant patenting legislation until additional research can be done. We further encourage:

Increased funding of government seed breeding programs as state land grant institutions to diversify and increase germ plasma resources;

Incentives for individuals to maintain so-called "heirloom varieties" which encourage genetic diversity; this must be done through actual growing and use since seed collection and storage programs have limited effectiveness;

Tax, loan, or research funding incentives for small companies without extensive funds or research departments to continue to make heirloom varieties available;

Public accountability on the part of seed corporations and governmental agencies such as USDA relative to decisions made regarding seed/food crops;

A broader sharing of experiences, pitfalls, debates, etc., with other countries involved in this issue;

More research, more questions, more hearings, and more time to consider the issues.

Thank you for your attention to our concerns.

STATEMENT OF TOM SUTTON, PUBLIC CITIZEN'S CONGRESS WATCH

Many members of Congress have expressed considerable surprise at the public reaction to S. 23. Why such a seemingly innocuous set of amendments to a ten-year old law governing a subject so arcane as plant breeding could evoke such an outcry has apparently escaped the comprehension of many who have been following this controversy. We at Public Citizen believe it is imperative that this subcommittee focus not only on the limited scope of S. 23, but also on the 1970 statute on which it is based.

A review of the press accounts of this legislation over the past two years indicates that (1) it has received very little attention, and (2) most of what has been written tends to concentrate on one of two rather sensational angles: the specter of government interference with gardeners growing varieties "outlawed" by the European Economic Community, or the more abstract concern about the propriety of patenting forms of life. On the other hand, a review of the testimony and supporting literature on this topic leads us to the conculsion that the real issue here is that both the Plant Variety Protection Act of 1970 and these strengthening amendments promote the ever-increasing concentration of American corporate agriculture. The following observations only serve to highlight some of the most disturbing aspects of this central issue.

1. It is hardly arguable that the corporatization of American agriculture has proceeded apace during the last decade, and the availability of "certificates" and the royalties which accompany them since 1970 has had a pronounced impact on the seed industry in this country. In recent years Sandoz acquired Northrup-King, ITT has bought out Burpee Seeds, Ciba-Geigy has taken over Funk Seeds International, and Celanese has acquired both Cepril and Moran Seeds. These are only a few of the transactions which begin to define what L. William Teweles & Co.'s "The Global Seed Study" called an "acquirer's romance with the seed industry." [1] These investments are apparently paying off handsomely in terms of market control. For instance, only four companies—Sandoz, Upjohn, Union Carbide, and Purex—controlled 79 percent of all the bean patents in the United States as of 1979. Similarly, four corporations held 44 percent of the patents on cotton, six corporations held 66 percent of the patents on lettuce, and two corporations held 43 percent of the patents on peas.[2] Such market shares are highly desirable to large corporations who cast covetous eyes on a seed industry which has averaged a 19 percent rate of return in recent years according to Business Week. It should be emphasized that this headlong rush toward consolidation only began with the advent of protective patenting legislation.

2. If profitability were the sole consideration, we might expect to see all manner of corporations chasing American seed companies. In fact, the character of the acquiring concerns to date belies our expectations: the new owners of the American seed industry are predominantly chemical and pharmaceutical firms. A roster which includes such prominent firms as Upjohn, Pfizer, Celanese, Royal Dutch Shell, Rorer Amchem, Ciba-Geigy, Diamond Shamrock, Union Carbide, Olin, and Monsanto cannot be accounted for with reference to the seed industry's profit margin alone. Rather, we must look to "The Global Seed Study" for a clue to this phenomenon: "In contrast with many other farm suppliers the seed industry has largely avoided attack by consumer, ecological and regulatory bodies." Additionally, the authors note the tremendous potential for ". . . seed coating and pelleting, utilizing the seed as a delivery system for chemicals and biologicals to the field." [3] When the seed industry is touted as a safe port in a storm of concern about corporate responsibility, the reasons for its attractiveness begin to come into focus. Pat Mooney has pointed out that should the agribusiness diet of fertilizers and biocides be curbed, either by governmental edict or by a world energy supply situation, the loss of production could be marginally made up by an increase in cultivated acreage which would require more seed sales. On the other hand if available seed carries its own chemical inputs, the use of chemicals may be substantially increased even as other concerns are muted (i.e. the occupational health of farmworkers). Drug and petrochemical companies are understandably excited over the prospect of having their cake and eating it; their frenzied activity in seed company takeovers reflects a desire for the kind of profit protection and market control which flows from our system of "plant variety protection."

3. The gradual loss of genetic diversity in world and American agriculture has been bemoaned before this Subcommittee on several occasions, and with good

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[1] L. William Teweles & Co., "The Global Seed Study," Prospectus. October 1978, p. 7.

[2] Mooney, Pat R., "Seeds of the Earth." International Coalition for Development Action, 1979, p. 57.

[3] L. William Teweles & Co., op. cit., p. 6.

reason. The system of patents and royalties utilized by giant corporations to extract tremendous profits from the Green Revolution has so narrowed the World's genetic base that no less an authority than Nobel Peace Prize recipient Dr. Norman Borlaug has opposed plant patenting.[4] As Secretary of Agriculture Bob Bergland had conceded, three-fourths of all vegetable varieties now grown may become extinct by 1991.[5] As the marketing strategies which have worked so well here take hold in the Third World, we can expect continual erosion of our genetic resources as subsistence farmers are persuaded to throw out their traditional varieties in favor of "improved, uniform and high-yield" varieties sold by mulitnational concerns and protected by a world-wide system of patents and royalties. Such "improvement" will come only at a high cost, as American farmers can attest: only fuel prices rose faster than seed prices among agricultural inputs in this country during the last decade. Thus American gardeners and consumers today find fewer varieties from which to choose, at an artificially inflated cost. Unpalatable as this situation is for us, it pales in comparison to the biological disaster which threatens less developed countries caught up in a global distribution and marketing system which denies the value of their traditional crops. That value should not be lost on us as we contemplate the Third World origins of vitrually all of our major food crops and the extraordinary degree of interdependence that marks the food supply of mankind. Corporate breeders have bred our plants for high yield and ease in processing at the expense of such qualities as disease and pest resistance and nutritional content. In our view this trend is neither desirable nor sustainable over the long term. On the international level it invites massive crop failures for the sake of marketing varieties which are often best known only because of the corporate advertising budgets promoting them; domestically our uniformity bias leaves us vulnerable to biological disasters of a magniture comparable to the Southern corn blight of 1970–71.

4. It should come as no surprise that the principle of free exchange of information and materials has suffered greatly under the PVPA of 1970. Then Secretary of Agriculture Orville Freeman stated in 1968 that, "If seeds and seed-producing plants had originally been included within the scope of the plant patent statutes (1930), a free and uninhibited communication among breeders, both public and private, would not have been possible."[6] The accuracy of Secretary Freeman's analysis is confirmed in a study by plant scientist Gary Nabhan of the Meals for Millions Foundation, who finds that "since 1972, not a single private agribusiness breeder has published descriptions of breeding schemes or techniques for their new varieties in HortScience's "Cultivar and Germplasm Releases" section, the most popular outlet for such information among university and government breeders." An increasing tendency to rely on corporate research and development can only reinforce the biases against pest and disease resistance and nutritional quality mentioned above; it also makes public sector investment seem less necessary at the level of land grant universities and experimental stations, which have historically provided varieties adaptive to regional soil and climatic conditions. Such are the consequences of allowing private interests to denigrate a central principle of scientific endeavor: that research, not simply its results, be made generally available to the scientific community for the advancement of all.

5. The use of our patent system to protect the breeders of plants was questioned by a Presidential commission some fourteen years ago, but its findings went unheeded it the 91st Congress' rush to adjourn. Now the Supreme Court has based its decision in the General Electric case on an interpretation of congressional actions in the area, the 1970 statute being the most recent of those. We are left with questions for this Subcommittee and, perhaps, the Committee on the Judiciary as well. Can the breeder of a "new variety which is really the product of a genetic heritage of thousands of years of human cultivation and chance mutation be said to fit the description of an "Inventor" with a "Discovery" found in Article 1, Section 8 of the Constitution? If so, to what degree must the breeder differentiate between the original genetic material and the new creation? Does the apparent lack of an answer to this question explain the fact that in every instance where the word "specification" appears in the original Plant Variety Protection Act, the word "description" has been substituted in S. 23? Religious organizations are by no means alone in asking such questions, and the nature of the Court's ruling in this area suggests that the Congress would do well to seriously review the long-range implications of its lawmaking.

As Senator Stewart has suggested, hearings should be held to expolore the troublesome record of USDA in the area of germplasm conservation, with particular attention to the inadequacy and vulnerability of the Fort Collins storage facility and its implications for our national interests.

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[4] Saskatchewan Council for International Co-operation, telephone conversations with Dr. Norman Borlaug, June 27 and June 30, 1978.

[5] Letter to Senator Thomas F. Eagleton, Aug. 14, 1979.

[6] Mooney, Pat R., op. cit., p. 74.

Specifically with regard to S. 23, we oppose any broadening of the impact of the Plant Variety protection Act of 1970. We submit that the alleged benefits of the original legislation, when weighed against the associated costs to non-corporate farmers, gardeners, and present and future generations of consumers, require its complete reevaluation. In lieu of the kind of thorough, independent analysis which this Subcommittee has the authority to require, S. 23 must be considered special interest legislation, and we will continue to oppose it. Moreover, in light of a decade of experience with the Plant Variety Protection Act of 1970, the Congress should move to repeal this ill-considered and damaging legislation rather than compounding its past mistakes through further amendments.

Thank you for the opportunity to present our views before this Subcommittee.

Statement of Timothy C. Weiskel, Andrew W. Mellon Faculty Fellow, Harvard University

I am writing to present before the Senate Agricultural Subcommittee on Research some of the implications of the currently proposed amendments to the Plant Variety Protection Act. I am trained as an anthropologist and an historian of Africa, and over the last fifteen years I have been working on issues related to agricultural production and social and economic change in Third World countries. While the opinions expressed here are my own, they are nonetheless shared by many of my colleagues in the fields of anthropology and agricultural development, and for this reason I would hope that the Senate Agricultural Subcommittee would give these views deliberate and extended consideration as it meets to consider S. 23.

In my opinion and the opinion of many who have studied closely the conditions of the food producton systems in the world at large, any legislation that creates or extends patent privileges to plant species should be opposed for two sets of related reasons: first, such legislation would facilitate the development of large-scale control in private hands over the organization and future development of agriculture in this country and abroad. As past experience has proved, this tendency towards centralized control in private hands of agricultural resources leads to unstable and potentially explosive economic and political conditions, particularly in Third World countries. Secondly, legislation to create or extend patents to plants would serve to hasten the broader ecological trend towards world-wide genetic variability collapse—a trend which looms as perhaps the most serious long-range problem facing mankind next to nuclear war itself. These issues deserve some elaboration.

THE ECONOMIC AND POLITICAL IMPLICATIONS OF PLANT PATENTING WITH SPECIAL REFERENCE TO THIRD WORLD REGIONS

It is widely acknowledged that many of the world's poorest nations are facing famine, starvation and death for lack of food supplies. Population increases have outstripped food production in many areas, and accelerated urbanization in these same countries has accentuated the need for remaining rural populations to produce increased agricultural surpluses to provide for urban dwellers. In these circumstances the food producing systems in many Third World countries have been strained to their sustainable ecological limits and beyond, and a cycle of over-cropping and under-production has begun to set in, leading in many cases to chronic and increasingly severe food shortages. In the short run, governments in these countries have had to turn to international food assistance programs to meet shortfalls of production while they "buy time" to undertake the necessary reform of their agricultural structures to restore food self-sufficiency.

There are a variety of avenues that are available to countries in this situation to restore their food self-sufficiency, but so far only a few have been tried. Most experts would agree that a long-term strategy for achieving food self-sufficiency requires a combination of land reform measures, the creation of market and credit facilities for peasants, and the application of appropriate technologies suited to specific ecological and environmental constraints. The particular "mix" of policies varies from county to country, but the goal is to revive decentralized peasant production simultaneously to increase output and create rural employment so as to reduce dependency on imported foodstuffs and stem the tide of landless peasants towards urban centers. Although it is widely recognized that a whole series of coordinated policies designed to create these conditions holds the most promising long-range solution to the problem of food self-sufficiency, few countries have implemented the reforms necessary. The reason for this is that such reforms would in most cases seriously challenge the land holdings or business interests of the politically powerful elites in these areas.

Instead, many governments in the Third World have chosen the seemingly quicker solution of adopting the agrotechnologies based on introducing mechanized production of "high-yield" varieties of wheat, maize, rice, sorghum, millet, etc. This "Green Revolution" approach appeals to the politically powerful elites in these countries for it does not challenge their dominant position as businessmen or landholders. On the contrary, given the scale of productive enterprises needed to introduce this technology and the amount of capital investment required to launch it, the "Green Revolution" approach has tended to favor large capital-intensive production, and in this respect it has served to re-inforce the privilege of the existing elites.

What is perhaps more tragic, over time the "high-yield" technological package has not delivered on its basic promise—that is, the provision of more food to more people. Impressive short-term production increases can be cited in individual instances, but the statistics often mask the enormous economic and social costs of production and totally ignore the ensuing problems of food distribution within any one country or internationally. The need to buy all the fertilizers, pesticides and required mechanical equipment necessary to make the "high-yield" varieties grow often places the countries in question further in debt than previously. The so called "high-yield" varieties are in reality "high-cost" varieties. With the escalating costs of petroleum related inputs to agriculture these "high-cost" varieties will increasingly recede beyond the reach of all but the richest of farmers. When cost-benefit studies are conducted in detail in countries that have adopted the "high-yield" path, it becomes abundantly clear that those who pay the costs are not those who reap the benefits.

Furthermore, the capital-intensive nature of the production package associated with "high-yield" varieties has not created significant levels of rural employment. Indeed, the technological approach often generates a poverty-stricken peasantry that is driven off its land into urban centers to make way for the larger land holdings of the national or international firms that introduce this technology. As the Iranian case proves in recent history, and numerous cases from Latin America suggest as well, it is this landless peasantry that can prove to be the most politically volatile segment of the population as it crowds into urban centers in search of the means to survive. To this extent it can be said that "high-yield" agrotechnologies, as they have been introduced in numerous Third World countries, have actually exacerbated the social and economic problems they promised to resolve. These problems in turn help to generate the conditions of political instability in Third World countries that have persistently proved embarrassing, costly and indeed dangerous to United States national interests abroad.

It is not the business of this Agricultural Subcommittee to dabble in matters of foreign policy. Equally, however, it is not acceptable for this Subcommittee to ignore the broader implications of the legislation it is called upon to consider. Seed companies have a clear vested interest in extending patent controls over plant varieties in order to gain greater control over the marketing of new "improved" strains. Once these patent rights are extended to some foodstuffs it will be increasingly difficult to limit their extension to others, and in many cases the varieties concerned will be those upon which the Third World countries depend for their agriculture. Since the seed companies themselves are being acquired by multi-national petrochemical firms, future research on crop improvement will be finely tuned to coordinate with the development of other agricultural inputs provided by these same companies, including chemical pesticides and fertilizers. As these integrated firms seek to extend their operations abroad in search of profits, Third World countries will be in a very vulnerable position. Those that have opted for "high-yield" agrotechnologies to meet their short-term food production needs will be in the position of having to accept the entire "package" of technology offered by particular firms.

There are two very important implications of this inevitable—even if inadvertent—scenario. First, Third World countries will be at the mercy of those firms that provide the integrated agrotechnology "packages." Since the seeds will be developed to respond to particular pesticide-fertilizer inputs, it will be impossible for a given country to purchase just one element in the "package". In the first instance, it is conceivable that "miracle" seeds of this sort could be provided very cheaply. Indeed, because profits would be determined by the "package" as a whole, it is even possible that the seeds themselves could be provided free of charge, since it would be possible to recuperate profits on the provision of other agro-inputs necessary to make the seeds grow.

At first glance, it may seem that "free" seeds would be a real "gift" to the Third World countries, but upon closer scrutiny it is clear that to accept such "gifts" a country would place its agriculture in serious dependence upon the multi-national concerned, particularly when it becomes evident that such a country would have to gear its entire agricultural infrastructure (i.e. irrigation systems, marketing systems, mechanized implements) to adjust to the new "miracle" variety. In analytical terms, the country concerned would become little more than the "hired hand" necessary to plant the seed and assure the return in profit to the mult-national which retained control over all the crucial agricultural inputs. It is possible, in fact probable, that in such a venture the country concerned would have to sell the commodity produced at relatively high rates simply in order to be able to repay the debts it incurred for the inputs. Thus, such a country would increase its overall dependence of foreign agricultural technology and in the process exacerbate the socio-economic disparities between its classes without providing significantly greater food for its expanding population.

This predictable pattern of events highlights the second important implication of legislation extending plant patent rights to private concerns. In the past, crop research has proceeded primarily in publically financed institutes and international crop research institutes financed by the Rockefeller Foundation, the Ford Foundation and various international bodies. The results of the research in these institutes have been freely available to qualified individuals, and many bi-lateral aid programs established between the U.S. and other countries have sought to apply the research findings in these institutes to specific needs in particular regions. Arrangements have been made between nation-states to share advances in technology, and the United States has clearly benefitted from this free access to plant breeding research in the pursuit of its foreign policy in Third World areas.

This situation would be dramatically altered if legislation were to grant exclusive plant patent rights to private concerns. In effect, such legislation would have the consequence of forcing the United States as a nation to abdicate much of its control to multi-national firms over the basic elements of its future foreign policy towards Third World countries. To the extent that fundamental plant genetic research passes from public to private hands, the United States as a nation would be obliged to tailor its international food and agricultural assistance programs to the needs and interests of the multi-national firms that gained control over this technology. This would mean that the United States as a nation would virtually lose the initiative to formulate its own foreign policy. In matters of food and agriculture the United States, no less than the Third World countries themselves, would be left with no other option but to submit to whatever the multi-national firms would be capable (or willing) to provide. In the wake of the international oil crisis, it takes little imagination to see that the interests of multi-national firms that control a basic resource do not always coincide with the interests of the American people.

The Agricultural Subcommittee is not called upon to fiddle in foreign policy matters, but it is called upon to consider soberly all the implications of the proposed legislation in S. 23. It may be argued by some that favor this legislation that the limited question of plant patent rights has no direct connection with these broader questions. By the same logic, of course, the particular legal statutes establishing OPEC as an organization had no direct connection with the rise in oil prices or long gasoline lines in the United States. No one would be foolish enough to argue, however, that once it was established, OPEC had no effect on oil prices. The Agricultural Subcommittee now faces a major political decision in considering S. 23. If it passes legislation to extend plant patent rights, it will be establishing the basic legal machinery that will facilitate the development of monopoly control over vital agricultural resources. To do so would mark a fundamental abdication of public responsibility and a flagrant betrayal of public trust.

ECOLOGICAL IMPLICATIONS OF PLANT PATENTING

In addition to creating the conditions necessary for the development of OPEC-like cartels in the seed and agricultural petrochemical industries, the proposed legislation would accelerate the erosion of global plant genetic resources. Once again, the issue is not what the strict wording of the legislation permits or does not permit, but rather what the fact of plant patenting in general would encourage, facilitate, and indeed, render inevitable—even if unintended. In this respect the Agricultural Subcommittee must give careful consideration at this juncture not only to the legislation itself, but to the overall context in which this legislation would function.

Ecologists in this country and abroad have been drawing the attention of scholars, scientists and public officials to the growing trend of world-wide plant genetic erosion. The dimensions of this problem are alarming by any standard. Ecologists have estimated that of all the animal species known to have become extinct, more than half have disappeared since 1900. The situation is more alarming concerning plant species. At current rates of extinction, Erna Bennet of the United Nations

Food and Agricultural Organization estimates that by 1991 fully three-quarters of all the vegetable varieties now grown in Europe will be extinct. Dr. Norman Myers, wildlife specialist and author of "The Sinking Ark," estimates that right now probably at least one plant species is disappearing each day and if the current acceleration of extinctions is not checked, mankind will be losing plant species at the rate of one per hour within a few years.

Those, like Secretary of Agriculture, Robert Bergland, who assert that "this phenomenon has no relationship" to this plant patenting legislation are dangerously mis-informed. Clearly, the legislation does not explicitly call for the extinction of crops; but equally clearly, it establishes conditions that make world-wide crop genetic erosion profitable for private companies. It is in the vested interest of such companies to control a larger and larger share of the market. This can and will be done both by edging out smaller seed companies and by massively displacing a wide variety of genetically varied seed materials currently grown throughout the world. If the Agricultural Subcommittee were to pass this legislation, it would be acting to place the increasingly scarce plant genetic resources into the exclusive hands of private firms, and this in turn would create conditions where world-wide crop genetic collapse would become extremely profitable. It is unrealistic to expect that companies will voluntarily and collectively refrain from exploiting such profitable possibilities.

The analogy with OPEC once again clarifies the implications of S. 23. Many OPEC members began to realize that the most profitable means of obtaining returns on their oil was in fact to restrict production and let market prices rise to advantageous levels for super-profits. Similarly, once local agricultural varieties in Third World nations have been displaced by new "high-yield" varieties, the companies that provide these varieties will be in a position to restrict and control the distribution of the "miracle" seeds (upon which these countries as well as the United States will have come to depend) to the point where they can extort super-profits.

Clearly such a scenario is in the vested interest of the seed companies concerned and the petrochemical companies that are acquiring them, but it is diametrically opposed to the interests of the Third World countries, the United States government, the American consumer and generations yet unborn. Third World areas can not long afford such high cost agricultural systems, and they will face massive starvation as an alternative. These conditions themselves, while assuring guaranteed profits for seed companies, nevertheless create unstable political conditions and generate vociferous anti-American sentiment in Third World areas, making it enormously difficult for the United States government to conduct a humane and stable foreign policy with these countries. Finally, crop genetic erosion, which works for the short-term benefit and enormous profit of particular seed companies, spells disaster on a global scale for long-term world crop production. Generations to come will depend no less than we do on the rich variety of crop genetic material in the natural environment. If we act now by this type of legislation to make it profitable to restrict genetic variability and extend genetic uniformity, we are endangering the survival of mankind as a species.

While the immediate indices of this disaster will first appear in Third World areas, the United States will be no less a victim of crop genetic erosion than the Third World itself. The reasons for this are related directly to the highly vulnerable position of American agriculture. While productivity levels appear to be high, the genetic base of American agriculture is dangerously narrow. The United States depends for a large portion of its production on a remarkably few species of plants, and ecologically this is alarming. Ecologist Paul Erlich explains why:

"In nature, plants are engaged in a continous stepwise evolutionary battle with plant diseases and herbivores. Plants' enemies are always evolving new methods of attack to counter the constantly evolving defences of the plants themselves. Likewise, crops are involved in a "co-evolutionary race" with the pests and diseases that attack them. A resistant crop strain will produce high yields only until one of its attackers evolves a way to overcome the resistance." (Technology Review, (Mar.-Apr. 1980), p. 61)

In short, the structure of American agriculture is crucially dependent upon the continous development of new crop strains to keep pace in this "co-evolutionary race."

The difficulty is that these new crop varieties cannot be generated out of thin air. The parent strains that contain the basic genetic material to develop new forms of resistant varieties are to be found in natural habitats—many of them in precisely those areas of the Third World that are currently coming under pressure from expanded planting of "high-yield" varieties. As Paul Erlich explains it:

"The raw material the plant breeders must use is genetic variability—variability that was once abundant in the multitudinous strains of crops that were planted all over the world, and in their wild ancestors. But in recent decades, in part as a result of the "green revolution," the number of crop strains has been greatly reduced. In some areas of Turkey, for example, numerous varieties of wheat used to be planted. Now only one "miracle" strain can be found." (Technology Review, (Mar.-Apr. 1980), p. 61)

What is true of wheat in Turkey is in varying degrees true of maize in Mexico, potatoes in the Andes and rice in the Philippines and South East Asia, and the extinction of native varieties in these regions which have historically accounted for the origins of these crops drastically reduces the material available to American scientists for future crop development.

Those that favor plant patenting rights are seeking to establish them in order in part to facilitate their expansion into foreign markets. To the extent that seed and petrochemical companies extend the cultivation of their seed varieties into areas of the Third World that contain the primary genetic material needed for future crop research and development, these primary materials will be lost forever in most cases. The problem is a global one, and American agriculture will suffer as much in the long run—indeed, given its vulnerability, perhaps even more—from this process of genetic extinction as will the agricultural systems in the immediate areas concerned in the Third World.

This is not simply a remote academic question or one limited to the pleadings of a handful of environmentalists. This concerns us all. It transcends partisan politics and supersedes anyone's particular philosophy about the relationship between the private and public sector. It is imperative that public officials act responsibly in the face of this problem not only for the sake of their constituents, or even for America as a whole, but for mankind at large. As Paul Erlich reminds us:

"This decay of real and potential variability of crops is one of the least recognized but most important factors in the deterioration of the human environment. If it goes too far, *Homo sapiens* will be permanently out of the business of high-yield agriculture which, with the present world population, would be an unprecedented catastrophe. . . . *Aside from nuclear war, there is probably no more serious environmental threat than the continued decay of the genetic variability of crops.*" (Technology Review (Mar.-Apr. 1980), p. 61; and Ecoscience, p. 344) (Emphasis in original.)

It is not possible for the Senate Agriculture Subcommittee on its own to stem the global trend towards world-wide plant genetic erosion. Nevertheless, the Subcommittee has a fundamental obligation to oppose any and all legislation which comes before it that would have the effect of facilitating, assisting or accelerating the trend towards the extinction of plant genetic resources. By extending patent rights to plant varieties, S. 23 effectively creates incentives for seed companies to extend genetic uniformity as they seek to gain control over larger and larger portions of the market with seeds under their exclusive patents. In operational terms, creating or extending plant patent rights inevitably—even if inadvertantly—accelerates the trend towards global crop genetic erosion. In legal terms it may prove impossible to assign "guilt" for individual plant extinctions, but it is clearly evident which parties are guilty of facilitating, assisting and making profit from this process as a whole, and it is for this reason that the deliberations of the Senate Agricultural Subcommittee are being watched with great interest by concerned citizens in academic institutions, scientific research institutes, development agencies, farmers organizations and consumer groups in this country and around the world.

The issue is not the particular wording of the amendments. Nor is the motivation of those favoring the legislation is question. Seed companies are in business to make a profit, and it is clear that such legislation would grant them wind-fall profits by creating the conditions for them to develop OPEC-like seed and petrochemical cartels. The question before the Senate Agricultural Subcommittee, however, is clearly whether the vested interests of these companies should take precedence over the real and imminent dangers to the American farmer, the consuming public and the world at large if patents are to be extended over plant genetic material. Further crop genetic research is urgently needed to sustain American and world-wide agricultural systems, but it is a matter of vital importance that this research remain in the public domain and not become the exclusive preserve of private interests. As responsible public officials you are now called upon to reject the extension of plant patent rights proposed in S. 23.

Environmental Defense Fund,
Washington, D.C., June 4, 1980.

Hon. Patrick J. Leahy,
U.S. Senator,
Russell Senate Office Building, Washington, D.C.

Dear Patrick: Because I will be on vacation for the rest of the month of June, I will be unable to testify in person at the hearing of the subcommittee on Agricultural Research and General Legislation on S. 23 on June 17, 1980. Enclosed is the statement being submitted for the record, and which I would like to call to your attention in the hope that you do plan to attend that hearing.

My statement details the legislative history of how plants obtained patents in 1930 and 1970. It also tries to develop the connection between plant patenting, genetic uniformity and genetic vulnerability. Of particular interest to you, I hope, is the role that the Senate Judiciary Committee and Subcommittee on Antitrust and Monopoly can play in 1980. Birch Bayh has been chairing hearings on his patent bills to separate the Patent Office from Commerce and create an independent agency. He and Metzenbaum are key to persuading Kennedy to ask for joint jurisdiction or sequential referral. Does it make sense to have the Commerce Department issuing patents to nonsexually reproduced plants, and USDA issuing patent-like rights to sexually reproduced plants? Surely the Judiciary Committee should be reviewing legislation affecting patents for living organisms, and in fact is the precedent on which the Supreme Court is deciding patentability of living organisms.

If you have any questions about this issue, I would like to refer you to Jack Doyle, Director of the Environmental Policy Center's Rural Land and Energy Project. We worked together on the House side of this issue.

With best wishes always,

Sincerely,

Maureen K. Hinkle,
Pesticides Monitor.

Statement of Maureen K. Hinkle, Pesticides Monitor, Environmental Defense Fund

The Environmental Defense Fund (EDF) appreciates this opportunity to testify before the Senate Agriculture Subcommittee on the Plant Variety Protection Act of 1970 (PVPA). The past decade of monitoring pesticide problems has brought to EDF an appreciation of many related factors involved in the task of producing and protecting our food supply.

We therefore welcome this opportunity to go on record as favoring Congressional focus on genetic plant resources and germplasm programs. We urge high priority for this vital issue which deserves thorough, comprehensive hearings, with testimony from a broad range of interested scientists. The views of officials and scientists in other countries should also be sought before action by Congress on this international issue.

In our view, the S. 23 amendments are framed narrowly, but they in fact have far-reaching consequences. We suggest that the impact of the 1970 Law needs to be ascertained before broadened to include additional food crops. After a review of the legislative history of the 1930 Law, hearings on patent law revisions in 1968, and the 1970 Act, we respectfully oppose H.R. 999 on the following grounds.

We believe the PVPA contributes to scientific and legal problems on plant variety restriction to which S. 23 would only add. The PVPA inhibits free exchange and access to information on germ plasm. Policy implications of this legislation, of concern to us, include genetic uniformity, genetic vulnerability, and "genetic suffocation" or disappearance of traditional varieties. As mankind has been plagued by pests since ancient times, epidemics have had, and will continue to have, devastating effects on crop production and thus on the stability of human societies. Genetic vulnerability has been a major aspect of such episodes.

If patenting of seeds accentuates genetic uniformity, we should know what part this protection plays and how to encourage genetic diversity. Finally, we would like to comment on the role of germ plasm diversity in meeting the need to produce food for a growing world.

LEGISLATIVE HISTORY

Patent laws have been in force since 1474 (in Venice), but the Plant Patent Act of 1930, signed by President Hoover on May 23, 1930, was the first law to provide for special patents for plants.[1] Agreement was reached in 1929 by interested parties to limit patent legislation to asexually reproduced plants after official information that "the inclusion of sexually reproduced plants resulting from the crossing of the male and female would show variations in plant characteristics which would make enforcement under the patent law impractical or impossible."[2] The bill was passed without discussion or recorded vote, and has been described as "thrown together hastily and practically no thought given to many of the problems involved."[3]

President Johnson appointed a Commission to review the United States patent systems on July 23, 1965. Of the 35 recommendations presented on November 17, 1966, Recommendation IV dealt with Plant Patents, as follows: "All provisions in the patent statute for plant patents shall be deleted, and another form of protection provided." The reason, given by the President's Commission, was that it did "not consider the patent system the proper vehicle for the protection of such subject matter," and urged further study to determine the most appropriate means of protection.[4]

Pursuant to the Commission's recommendation and in preparation for Senate hearings, the Patent Office requested comments in the Federal Register on January 3, 1968. The responses indicated considerable division within the agricultural community. Objections were raised as to the difficulty in administering a program wherein differences in indentification of varieties would prevail, and such patents would inhibit governmental research in this area. The value and enforcement of such protection were thus questioned. Consequently, the Patent Office withheld comment on the amendment to extend patents to sexually reproduced plants until supporters of the provision could develop "more convincing factual evidence that the Amendment is both feasible and necessary."[5]

The U.S. Department of Agricultural (USDA) opposed extending patents to sexually produced plants on the following grounds: such patenting would (a) interfere with the free exchange of information, (b) the patenting of sexually reproduced plants is scientifically difficult or impossible because of the inherent variability of seed-propagated plants, and (c) difficulty of proof in infringement litigation as well as difficulty in enforcement of a patent in seed-producing plants.[6]

In 1968, opposition to plant patenting for sexually produced varieties also included "practically all the plant breeders, geneticists, horticulturists, and other scientific groups . . . interested in the advancement of the programs and activities, both public and private, for the improvement of varieties of plants." These groups were not so opposed to plant patenting per se as much as these scientists, familiar with plant breeding and improvement of horicultural varieties, were "unanimous in urging very careful study of any basic changes in the plant patent law [of 1930 which excluded sexually produced plants] until full consideration of the far-reaching consequences could be made by the various groups interested and directly affected by such proposed changes."[7]

At the time Congress was considering revisions of the Patent Law in 1978, the American Seed Association urged extension of the 1930 Act to include sexually reproduced plants. As the representations of the Pioneer Seed Company described the action, "Initially they were naive enough to think they could develop a system that would be within the Patent Act itself and a bill was introduced to merely expand the Plant Patent Act to include sexually reproduced plants as well as the asexually reproduced plants. They found immediate opposition to this from many sectors and it proved politically unavailable to them. They then started looking for a different system that would be politically available."[8] Protection from the Department of Agriculture was accepted in 1979 as "better than nothing."[9]

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[1] Patent Law Revision: Hearings on S. 2, S. 1042, S. 1377, S. 1691, S. 2164, S. 2597 before the Subcommittee on Patents, Trademarks, and Copyrights, Committee of the Judiciary, U.S. Senate, 90th Cong., 2d Sess, part 2, January 30, 31, Feb. 1, 1978, at 788, 792 (Paper by Donald G. Daus, "Plant Patents: A Potentially Extinct Variety," Econ. Botany, Oct.-Dec. 1967).

[2] Plant Variety Protection Act Hearings before the Subcommittee on Agricultural Research and General Legislation of the Committee on Agriculture and Forestry, U.S. Senate, 91st Cong., 2d Sess., on S. 3070, June 11, 1970, at 80 (Statement of Paul C. Stark).

[3] Allyn, R. S., "The First Plant Patents," a discussion of the new law and patent office practice (1934), at 57.

[4] Patent Law Revision Hearings (1968), supra, at 648. ("Legal Protection for New Plant Varieties which Reproduce Sexually," by the National Council of Commercial Plant Breeders, (Jan. 1968).

[5] Patent Law Revision Hearings, supra at 884–85 (Letter of May 31, 1968, from Edward J. Brenner, Commissioner of Patents, Department of Commerce, to Senator McClellan.)

[6] Patent Law Revision Hearings, supra, at 715–19.

[7] Patent Law Revision Hearings, supra, at 866 (Report submitted by Paul C. Stark, Stark Brothers' Nurseries and Orchards, Louisiana, Missouri, Mar. 28, 1968).

The 1970 legislation was essentially drafted at a meeting on March 25–26, 1979, between officials of the seed associations, seed control association, the State Agriculture Experiment Station's Directors, and USDA's ARS and Consumer and Marketing Service.[10] With the protection of plants to be administered by USDA as a "registration" program, opposition was reduced to Campbell Soup Company and the American Frozen Food Institute for whom Section 144 was added to exempt the soup vegetables. The provision for farmers to produce certified seed for their own use was also allowed, which eliminated opposition from that group. As in the case of the 1930 Act, the 1970 Act was passed with no recorded vote.

SCIENTIFIC AND LEGAL PROBLEMS OF PLANT VARIETY RESTRICTIONS

The effect of the 1970 Law is still unknown and scientific and legal questions raised in 1968 and 1970 are still unanswered. For example, the legal significance of the word "variety" has not been construed, and plant patents, either sexually or asexually produced, have as yet no judicial yardstick as to patentability.[11] Distinctions between patents, patent-like rights, and breeder's rights also need to be clarified. Breeder's rights require prior authorization for production for commercial markets of the reproductive or vegetative propagating material (including whole plants) of the protected variety.[12] Utility, or meritorious performance, is not required for conventional breeder's rights, whereas a new patent must be useful. The rights of a breeder are positive, as compared to the patentee's right to exclude others from reproducing, using or selling the variety, i.e., a monopoly.[13]

Before patent-like rights are approved, however, the "invention" must be capable of identification and distinction for the life of the patent right granted to it. If the certificate for exclusion is to confer the temporary legal monopoly upon the plant variety, it must be capable of precise definition and delineation.

One insurmountable difficulty of concern to breeders is the inherent instability and variations of seed-propagated plants. It has also been called genetic drift or constant shift. As the past President of the Crop Science of America stated, "The variability in sexually reproduced varieties and changes in type attributable to genetic shift would vitiate the intent of the patent system, which rests on the protection of unique and reproducible discoverings."[14] The variations produced in seed-propagated stock by different environments cannot be determined or predicted in advance. As the President of the American Frozen Food Institute testified in 1970, "Sexually produced varieties are on the average more variable and unstable from area to area, season to season, and generation to generation than are those asexually reproduced."[15] Moreover, verification itself may require growing under different environments which is an expensive and time-consuming process that small companies cannot afford.

The difficulty of description of a seed-reproduced plant with its variance over the years may make it impossible to positively identify the new variety and proving infringement. Few infringement suits have been filed, in the eight years following the first plant patents for a seed-reproduced plant variety (1972). The next decade, however, can be expected to be far busier for the Plant Varieties Office[16] which now needs eight full time professionals to process 110–125 applications per year.[17] Verification can be expected to be expensive and involve considerable controversy.

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[8] American Bar Association, 1970 Summary of Proceedings, Section of Patent, Trademark and Copyright Law, at 71 (Statement of Dale Porter).

[9] Id. at 72.

[10] House Hearings 1970, supra, at 56 (Statement by Allenby L. White, Chairman of the American Seed Trade Association's Breeders' Rights Study Committee).

[11] Patent Law Revision Hearings, supra, at 790.

[12] 1968 Senate Hearings, supra, at 793 (Article 5 of the Convention of Paris for the Protection of New Varieties of Plants, 1961).

[13] Allyn, R. S., supra, at 46.

[14] Patent Law Revision Hearings, supra, at 869 (Letter to Edward J. Brenner, Commissioner of Patents, Department of Commerce, from A. A. Hanson, Chief, Forage and Range Research Branch of the Crop Science Society of America, dated Jan. 17, 1968).

[15] Plant Variety Protection hearings, House of Representatives, Subcommittee on Departmental Operations of the Committee on Agriculture, on H.R. 13424, H.R. 13631, H.R. 13658, H.R. 13901, H.R. 14332, and H.R. 15226, 91st Cong., 2d Sess., June 10, 1970, at 58.

[16] See also letter from Professor Richard Levins, population ecologist and geneticist, Harvard University, to Rep. Kika de la Garza, dated April 10, 1980, elsewhere in these hearings.

[17] According to Commissioner Leese (April 17, 1980), there have been 1053 applications for new plant varieties by USDA since 1970; 671 have been granted. The budget of this office, which was supposed to be self-sustaining, has been reduced to $350,000. The three infringement suits involved varieties of a lima bean, a cotton, and a barley.

THE EFFECT OF PLANT PATENTS ON EXCHANGE OF INFORMATION ON GERM PLASM

The 1970 legislation was requested in order to bring legal protection to plant varieties in the United States which existed in Western Europe, although the United States was the first nation to provide special patents for plants (in 1930). The argument was then, and continues now, that plant protection will "greatly stimulate private plant breeding." [18]

Europeans and international organizations concerned with plant protection, however, have expressed their opinions that plant protection has restricted free exchange of germ plasm. FAO, for example, expressed the following concern as recently as April 17, 1980 in a letter to H.W.S. Horvill, British Association of Plant Breeders, from O. Brauer, Director of FOA Plant Production and Protection Division:

"FAO, as well as other agencies within the UN, are extremely concerned with the potentially disastrous situation arising from genetic erosion. There is no doubt whatever that genetic erosion has been accelerated by the widespread replacement of genetically diverse cereals by uniform varieties over very large areas without stimulating corresponding efforts to conserve genetic diversity at the same time. This last has been left to FAO and, more recently, to IBPGR, to organize, often only when a serious situation already exists. . . .

"As for the impact of plant varietal legislation on genetic resources, it is a fact that where such legislation is in force, increased obstacles exist to the full and free exchange of germ plasm to which FAO and other UN agencies are dedicated. Plant varietal legislation is concerned with establishing proprietal rights over certain genetic resources and this cannot but have a limiting effect on their availability." [19]

Also, as Declan J. Walton, FAO Director of IAA, wrote to L. E. Huguet, FAO Director of FOR, on February 28, 1980, UPOV's influence on plant breeding has already encouraged "private sector activities *at the cost of a corresponding reduction in the public sector.*" (Emphasis supplied.)

Similarly, E. J. Wellhausen (Rockefeller Foundation) wrote to Dan McCurry (Consumer Federation of America), on August 3, 1979 that CIMMYT [20] breeders take a strong stand against seed patenting legislation because "it restricts the free exchange of genetic materials."

In contrast, and prior to the 1970 Law, USDA, and other agencies such as the Agriculture experiment stations, and private breeders engaged in a program developing and introducing new and better seed varieties. When a new variety was considered valuable, an official notice of release signed by USDA and the cooperators was issued. Anyone could then grow or propagate these new varieties for sale to the general public. This encouraged the spread of new varieties.

The success of this program in developing new, disease-resistant and high yielding varieties was attributed in large measure to the free interchange of information, "experimental plants, and germ plasm among research workers without fear of misappropriation and use of any of this material." [21] Indeed, as the Vice President for vegetable research of Campbell Soups told this subcommittee in 1970, "unprecedented progress has been made under the existing system (prior to 1970) free of artifical controls and protection" wherein Campbell Soups released to the public domain 32 varieties of tomatoes, and many other varieties. The success of Campbell Soups' breeding efforts depended on the store of germ plasm and genetic material obtained on a free exchange basis among plant breeders from throughout the world, public and priviate.[22]

In addition, as the President Elect of the Crop Science Society of America (CSSA) told the Congress in 1968:

"The CSSA registers new varieties of field crops and superior germ plasm. This provides published information to the public on the origin and special value of new varieties. This assures that duplicate names will not be used in the register. However, the service is voluntary and no policing is involved. The U.S. Department of Agriculture also makes news releases about new seed varieties we develop and periodically we publish descriptions of these. In many cases the "distinctiveness" of these varieties is physiological and not of taxonomic value; in fact many varieties look alike." [23]

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[18] U.S. Code Congressional and Administrative News, Vol. 2, 91st Cong., 2d Sess., 1970, at 5083.

[19] The International Board for Plant Genetic Resources (IBPGR) with a secretariat of six, is an independent body created in 1974.

[20] International Maize and Wheat Improvement Center.

[21] Patent Law Revision Hearings, 1968, supra at 715.

[22] 1970 House Hearings, supra, at 57–58.

[23] 1968 Senate Hearings, supra, at 870.

The interdependence of public agencies, seed companies and processors, and a willingness to exchange information and germ plasm worked to the benefit of crop improvement through plant breeding prior to 1970. Most of the 450 to 500 new cultivars released each year represented minor genetic advances and "fine-tuned" adjustments to changes in production, harvesting, processing, and marketing procedures.[24] Great leaps ahead are not the rule, and the most desired characteristics "are generally achieved bit by bit with barely observable improvements over preceding generations." [25]

This trend may have been reversed by the 1970 legislation. Just prior to the passage of the PVPA in 1970, there was observed "a perceptible reluctance among plant breeders to exchange genetical material." [26] This was deemed to have been brought about in anticipation of plant protection legislation in the United States; similar to that in Europe. The emphasis should be on better, not necessarily more, varieties and those that will stand the test of time. The public sector must continue its creative efforts in breeding. In addition, "Industry cannot replace the public agencies as vehicles to solve the high risk projects that need to be undertaken in breeding if we are to progress." [27]

Commercial ties to existing varieties may prevent acceptance of varieties from non traditional breeding. During the 1960's, a Texas A&M plant pathologist named L. S. Bird drew upon some breeding techniques that had worked on other crops, developed his own procedures, and discovered some startling new germplasm in cottons. These plants produced a high yielding, short season variety which continued to perform under a wide range of changeable weather conditions. He made his varieties available to the private sector in the late 1960's, but industry refused to release them. Finally, in 1972, Texas A&M released three Bird cottons to make then available to farmers.[28] Public institutions may have to act in such instances in order to make such breakthroughs accessible to the public.

USDA told the Senate Judiciary Committee in 1968, "It is safe to say that the high quality and abundant harvests of our seed produced crops would not have reached their present porportions, but for the possibility of cooperation which the *absence of patents* on this category of plant engendered." (Emphasis supplied.)

Absence of patents has broad implications. For example, *penicillium* breeding contributed the major factor in reducing costs of penicillin. The pioneer selection had been done by the Department of Agriculture, and its policy of not patenting plant material may explain the absence of patents. The dramatic reduction in penicillin cost by strain selection and X-ray mutation is one of the most spectacular economic feats of plant genetics. This government financed breakthrough occurred a decade after discovery of the drug.[29]

Another problem involves security. To completely protect one's breeding program, whether private, federal or state, agencies would have to carefully guard all breeding material, and this would force public agencies to apply for public patents for all new varieties released. "Preliminary evaluation of 'experimental' varieties before their release is very important. To guard against possible loss of one's 'outstanding' line would require very close supervision and severely restricted use of advanced testing programs.[30]

Even with expensive safeguards, patentable seedlings might well escape, and without authority, be patented by others. This apparently occurred when a certified variety was obtained from the Mexican Government and then patented in Europe. Also, varieties have been stolen from the CIMMYT breeding program, multiplied in the United States, and patented under the PVPA.[31]

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[24] National Academy of Sciences, "Conservation of Germ Plasm Resources," 1978 at 23, and "Genetic Vulnerability of Major Crops," 1972, at 268.

[25] Plant Variety Protection Act Hearings, on H.R. 13424, before the Subcommittee on Oversight, Investigations and Research, Committee on Agriculture, 91st Cong., 2d Sess., June 10, 1970, at 58. 1970 House Hearings, supra, at 58 (Testimony of Thomas B. House, President, American Frozen Food Institute).

[26] Id. at 57. (Testimony of Eldrow Reeve).

[27] National Academy of Sciences, "Genetic Vulnerability of Major Crops," supra, at 268.

[28] The impact of these new varieties from crop production is dramatic: they resulted in yield increases and demonstrated that in some areas of Texas, cotton can be produced with 50 to 75 percent less insecticide, 80 percent less fertilizer, and 50 percent less irrigation water than conventional varieties grown under a high energy-input system. (Hearings on IPM before the Senate Agriculture Committee, Subcommittee on Agricultural Research and General Legislation, 95th Cong., 1st Sess., Oct. 31–Nov. 1, 1977, at 177.)

[29] Patent Law Revision Hearings, supra, at 791 (Paper by Donald G. Daus).

[30] Patent Law Revision Hearings, supra, at 800.

[31] Mooney, P., "Seeds of the Earth," August 1979, at 78.

UNIFORMITY

Section 41 of the PVPA (7 U.S.C. § 2401) requires that a plant's "novel variety" must show "distinctiveness," identifiable by "one or more identifiable morphological, physiological or other characteristics." However, as the National Academy of Sciences pointed out, "[t]o achieve novelty, uniformity, and reporoducability, breeders may concentrate heavily on incorporation of easily identifiable morphological traits into new materials and on achieving a high degree of homogeneity in them." [22] The broad germ plasm base and genetic diversity may thus be lost. This is the connection between patenting seeds and genetic uniformity.

There are, of course, many contributing factors to the genetic uniformity of our crops, but plant breeding for commercial purposes can be an enormous factor. As the National Academy of Sciences said:

". . . the selection process can itself result in serious loss of germplasm. Selection for particular traits at the expense of others very often leads to a narrowing of genetic diversity in the species. The reduction in genotypes is particularly likely to occur as techniques for mass rearing are adopted and culture conditions become more uniform through artificial control. The discarding of all strains except those best adapted to the conditions of domestication becomes a serious threat to the maintenance of the organism *if environmental conditions change, if susceptibility to predators changes, if parasites or pests develop,* or if there is need to select for different sets of characteristics. *Limiting the available types in a collection can be particularly serious if human* of other encroachment on natural habitats has meanwhile *depleted species diversity or has eliminated the species from natural communities.* (Emphasis supplied.) [23]

Commercial requirements also contribute to genetic uniformity. Section 41(a)(2) of the PVPA requires "uniformity in the sense that any variations are describable, predictable and *commercially acceptable.*" (Emphasis supplied.) Grading standards for minimum price support penalize growers unless produce meets commercial grading criteria. For example, in mixed peanuts warehousemen and shellers prefer to handle one or at best a few varieties, since separation of types and quality segregations add to their labor costs.[24]

Other segments of industry directly or indirectly encourage a narrow genetic profile by seeking to standardize quality attributes of end-use produce. Buyers of processed and fresh market beans and peas are very specific in their demands concerning the type and quality they will accept. The National Academy cited this as the major reason why a narrow genetic base underlies most snap bean and pea varieties now grown, as well as a host of other crops.[25] The need for high levels of uniformity in vegetable crops plus dependence on breeding for disease resistance render the vegetable industries in the United States vulnerable to disease epidemics.[26]

Not only at the marketplace and in the processing line, but in the field, factors at work operate to force uniformity. Ears of corn must be a uniform height for mechanical pickers. Stalks must be of uniform height in order not to interfere with weed-killing machinery. Tomatoes must ripen simultaneously so they can be mechanically harvested. *"If the genes for this uniformity happen also to make the crop more susceptible to a disease, an epidemic is in the making."* [27] (Emphasis supplied.)

Mankind's experience with epidemics has made possible awareness of certain relevant factors necessary to predict, and therefore reduce, losses due to their occurrence. These three factors are essential for epidemic pest populations: weather, pest, and host.[28] In this triangle, plants that are uniform render the crop vulnerable to pests. Disease begins in discrete areas that become epidemic if it spreads rapidly over large areas. How epidemics spread has been hypothesized to be related initially to the size of the pest population and the weather, but most important is the population of plants. Crowding and uniformity of plants can, for example, form a canopy of closely spaced crops which produce their own weather, or microclimate. A rapid increase can follow, leading to an explosive outbreak of disease, or epidemics.[29] When uniform crops exist over large areas, the situation is ripe for epidemics.

Although epidemics can often be predicted, genetic vulnerability is sometimes unforeseen. A classic example was found in oats. The Victoria gene for crown rust reaction was bred into . . . oat varieties . . . grown over extensive acreages. The presence of this gene permitted a fungus, *Helminthosporium victoriae* Meehan and Murphy, to parasitize and practically destroy a large part of the acreage of oats that carried the Victoria gene. this vulnerability was totally unexpected.[60]

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[22] National Academy of Sciences, "Genetic Vulnerability of Major Crops," 1972, at 87.

[23] "Conservation of Germplasm Resources—An Imperative," 1978, at 22.

[24] "Genetic Vulnerability of Major Crops," supra, at 22.

[25] Id. at 238, 246.

[26] "Genetic Vulnerability of Major Crops," supra, at 267.

[27] Id. at 29.

[28] Id. at 6, 26 and 27.

[29] "Genetic Vulnerability of Major Crops," supra at 29, 30.

Some of this unforeseen vulnerability can be eliminated in plant breeding programs. In the case of the vulnerability to Victoria blight, the vulnerability surfaced after new varieties were moved to new environments and a variant of a fungus developed and spread easily.

Yet another facet of the genetic vulnerability problem is the potential for the future. The National Academy cautioned the scientific community about "tunnel vision," as follows:

"Scientific tunnel vision may have obscured somewhat the significance for corn of the oat epidemic and of the phenomenon of drug resistance. The Texas male-sterile corn was deployed over a wide area, as was DDT against flies, with similar consequences: a new strain of *H. maydis* overcome the Texas strain of corn in the same way that a new strain of house flies overcame DDT.[61]

Unfortunately, insecticide resistance was paid precious little scientific attention for decades despite its existence since 1914, in the San Jose scale to lime sulfur spray. A look at the numbers of documented cases of insect resistance gives a clue to what may be in store for genetic vulnerability: 1948—12; 1951—16; 1954—25; 1957—76; 1960—137; 1963—159; 1968—224; 1976—364; 1980—400.[62]

It was the widespread use of insecticides which brought on and hastened the incidence of resistance. Crop uniformity over large acreages could produce a similar effect for epidemic potential. The challenge, therefore, for breeders is to provide diversity. He must, as the National Academy panel urged, "build redundancy into a back-up system." [63] In addition, they must search for new genes, and develop gene pools to preserve those they have.

Diversity is the key. In business and finance, diversification hedges against high risk. "Diversity also aids stability in the biological world," [64] and is the best insurance against epidemics.[65]

THE ROLE OF GERM PLASM DIVERSITY IN MEETING THE NEED TO PRODUCE FOOD FOR A GROWING WORLD

In its discussion of the role of plant genetic resources in agriculture, the National Academy stated:

"In cultivated crops germplasm resources are required to provide the genetic diversity needed to ensure future production. Plant genetic resources include wild species related to the cultivated species, folk varieties (or land races), obsolete and current cultivars, useful mutants, and stocks with improved combinations of genes developed as a consequence of research. This array of genetic diversity is essential to meet the constantly changing problems imposed by consumer needs, agricultural technology, environmental changes, pests, economic conditions, and other factors."[66]

In addition, a stable resistance to plant diseases can be achieved only with genetic diversity. The emphasis, however has to be on management, not breeding per se. Breeding techniques have evolved well, but "we have much to learn about managing genes, cultivars, and cultural practices to effect lasting stable resistance." [67]

On an international scale, cooperation should be greater and open. Yet, U.S. efforts have constrained and impeded a spirit of cooperation. In its discussion of germplasm, the Office of Technology Assessment made the following statement.

"Seeds and other breeding materials collected in centers of crop diversity are the only proven source for developing natural resistance in crops. Furthermore, they will be needed even if the dreams of genetic engineers become reality. For nearly a decade and a half, the United Nations' Food and Agriculture Organization has led in planning international efforts to collect and conserve crop variability. Since 1973, AR has had a similar plan to minimize genetic vulnerability of the nation's crops through germ plasm collection and conservation. Unfortunately, both U.S. and international efforts have not been adequately supported and developed to meet the needs of crop protection and related scientists. If these diverse genetic materials are not available to plant breeders, the long-term potentials of developing natural resistance and tolerance cannot be realized. The corollary task of understanding the basic mechanisms and genetics or resistance factors for each crop is also dependent upon the availability of such germ plasm.

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[60] Id. at 143.

[61] "Genetic Vulnerability of Major Crops," supra at 296.

[62] Metcalf, R. L., "Changing role of insecticides in crop production," Ann. Rev. Entomol., 1980 25:229.

[63] "Genetic Vulnerability of Major Crops," supra at 295.

[64] Browning, J. A., "Corn, Wheat, Rice, Man: Endangered Species," J. Environ. Quality, Vol. 1, No 3, 1972, 210.

[65] Id. at 294.

[66] "Conservation of Germplasm Resources," supra at 23.

[67] Browning, supra at 210.

"Our plant breeders, pathologists, and entomologists need first-hand experience with crops in the world centers of diversity. This can be facilitated by encouraging the expansion of national and international efforts."[48]

CONCLUSION

We suggest that the 1970 Law should be reexamined at length before any amendments to it are passed. As the 1972 panel appointed by the National Academy of Sciences urged, "The long-range effect of the Variety Protection Act on germ plasm development, preservation, and exchange should be studied." [49]

Put more bluntly, the study said:

"The law infrequently outruns biology; thus federal regulations in Canada designed to promote uniform wheat quality impose stringent requirements on development of new wheat varieties in that country. The indirect effect of this legislation has been to narrow the germ plasm base and increase potential vulnerability of Canadian wheat. A similar effect has developed from the enforcement of a one-variety cotton law in the San Joaquin valley of California and, more generally, from the recently enacted Federal Plant Variety Protection Law." [50]

An even graver indictment is contained in Erna Bennett's letter to the editor as follows.

"In Europe over the past nine centuries, a great wealth of genetic diversity in vegetable crops has evolved and been preserved by numberless individual cultivators which, in a single fell swoop by . . . legislators out of touch with scientific opinion, now stands in danger of almost total extinction." [51]

Agricultural leaders around the world also "recognize that the genetic variability of crops is shrinking and that valuable plant genetic resources are thereby being lost." [52] Two points were drawn by the 1978 National Academy panel:

"(a) Vulnerability stems from genetic uniformity; and (b) some American crops are on this basis highly vulnerable. This disturbing uniformity is not due to chance alone. The fources that produced it are powerful and they are varied. They pose a severe dilemma for the sciences that society holds responsible for its agriculture. How can society have the uniformity it demands without the hazards of epidemics to the crops that an expanding population must have?" [53]

The challenge is enormous, and with significance for the whole of society. We hope our testimony has helped to focus on some of the aspects involved in the Plant Variety Protection Act and amendments proposed for it.

RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY,
DEPARTMENT OF HORTICULTURE AND FORESTRY,
New Brunswick, N.J., June 4, 1980.

Hon. DONALD STEWART,
Chairman, Senate Agriculture Subcommittee on Research,
U.S. Senate, Washington, D.C.

DEAR SIRS: Later this month your Subcommittee will hold hearings on S. 23, a bill to modify the Plant Variety Protection Act. I offer the following comments as written testimony for the record of these hearings. My qualifications are more than thirteen years of teaching and writing on the subject of the side effects of modern agricultural technology, including two books partly on that subject, both published by the Oxford University Press.

I am strongly opposed to this legislation, and to the extension of the plant patenting idea in general, for the following reasons: First, the granting of patents for seed varieties inevitably leads to the concentration of seed holdings in the hands of a few large corporations. I do not think that it is in the interests of the United States to reduce the number of sources of its agricultural seeds.

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[48] OTA report, "Pest Management Strategies," GPO stock No. 052-003-00708-8, Constraints Section, at 22 and 23. (October 28, 1979).

[49] "Genetic Vulnerability of Major Crops," supra at 153.

[50] Id., at 291

[51] Letter to the editor of United Nations Development Forum, Geneva, Nov.-Dec., 1979, from E. Bennett, Genetic Conservationist, FOA, Rome. See also Aug. 14, 1979 letter to Senator Eagleton from Bob Bergland admitting, "The prediction that by 1991 three-fourths of all vegetable varieties grown now will become extinct may prove to be correct. Obsolete varieties (sic) are being replaced by improved varieties adapted to extended areas of agriculture."

[52] "Conservation of Germplasm Resources," supra at 24.

[53] Id., at 25.

Second, the patenting process requires considerable uniformity among seeds of a particular variety. While uniformity may be desirable in bullets or machine parts, it is not desirable in seeds. Some variety is always necessary both to cope with the inevitable changes in environmental conditions of different growing seasons and different locales and to provide the basis for future selection of superior varieties.

Third, the patenting of seed varieties will discourge attempts by individual growers to experiment in improving seed for their own purposes. Seed improvement is an art and a skill which should be widely practiced, because that is the most efficient way of finding superior new varieties and the only way of producing varieties adapted to local conditions of climate, soil, pests and diseases. Having adapted seeds reduces the need for pesticides and tillage, as well as irrigation, and this in turn saves energy and reduces environmental disruption. We must not allow seed improvement to become the exclusive work of a few corporate laboratories and experimental farms.

Fourth, and perhaps most important, an extension of seed patenting privileges is almost certain to cause a reduction in the number of existing seed varieties, and this is the greatest disaster that could possibly happen to modern agriculture. The National Academy of Sciences has already described the terrible dangers of genetic uniformity (especially in terms of vulnerability to pests, diseases, and unusual weather conditions that prevail over large regions) in agriculture, as have other witnesses, and I will not elaborate on their comments. Suffice it to say, that even without this legislation we are losing varieties of seeds at an alarming rate; if S. 23 is passed, the rate of loss will accelerate. When a few corporations compete for a large share of the market they do so by claiming the superiority of their product over all others. There is no way to design legislation to prevent this from happening, and the reduction in the number of seed varieties (which must be kept alive by having farmers grow them every season) will be the inevitable result. It should be pointed out that for both technical and ecological reasons, as well as the question of cost, seed banks are a totally inadequate substitute for a diversified agriculture with many varieties planted at the same time.

I regard as especially ominous the tendency for petrochemical companies to acquire seed companies and to promote patenting legislation. The members of the Senate Subcommittee should consider carefully whether they wish to place our agriculture in the same hands that now exert monopoly control over our petroleum.

Sincerely yours,

David W. Ehrenfeld, M.D., Ph. D.,
Professor.

Southeast Arkansas Community Action Corp.,
Warren, Ark., June 13, 1980.

Hon. Donald Stewart,
Chairman, Agricultural Research and General Legislation Subcommittee, Agricultural Committee, U.S. Senate, Washington, D.C.

Dear Sir: Please include my statement in the record of testimony given in opposition to the Plant Patent Amendments.

We believe that this trend is not in the interest of the small family farmer, or the general public with special damage to low-income persons who have home gardens.

We do not feel that patents are the way to benefit the general public. Patents would only make it more attractive to big corporations to enter the seed business. This is one more step in a trend toward commercialized farming which will allow control by a few companies of food prices and supply.

Thank you for your consideration of the enclosed information.

Very truly yours,

James M. Rogers, *Executive Director.*

Office of Human Concern,
Rogers, Ark., June 13, 1980.

Hon. Donald Stewart,
Chairman, Agricultural Research and General Legislation Subcommittee, Agriculture Committee, U.S. Senate, Washington, D.C.

Dear Senator Stewart: We wish this statement to be included in the record of testimony given on the Plant Patent Amendments.

Once again it appears that with all of our serious problems yet to be resolved dealing with the state of our economy the leaders (?) in Washington are searching out ways to worsen an already critical situation.

I speak now of the seed patent legislation on which hearings are to begin June 16, 1980.

How can a legislative body of mature and capable people suddenly with words written on paper, destroy a heritage of seed and plant development which in most cases began centuries ago in the form of unwanted weeds?

Tracing the heritage of our current garden variety vegetables is mostly impossible and perhaps irrelevant, but when our future strains of these same weed seeds are to be owned by a specific person or conglomerate, we as users of these seeds become totally subservient to that person or conglomerate, as our needs will no longer be met through resistant varieties that are readily adaptable to our soil and climate, unless they see fit to provide us with those needed seed at a cost they will also dictate.

The only economic solution to combat another attempt at dictating to the American people is to abort the attempts of the Corporate takeover of our seed supply. Then allow the hard working citizens of this country to purchase the seeds of life at a competitive cost which will afford them a reasonable product to feed their families.

This body might also wish to examine the fact that the fastest rising farm cost has been the cost of seed (National Science Foundation study).

Sincerely,

WALLACE E. SMITH, *Executive Director.*

Enclosure.

INFORMATION ON SEED VARIETIES AND RECENT SEED COMPANY ACQUISITIONS

According to the National Academy of Sciences, United States Agriculture is "alarmingly vulnerable to catastrophic epidemics" of seed crops. Consider these statistics:

100 percent of all Millet in North America is grown from three varieties of seeds.
96 percent of all peas come from two varieties of seeds.
76 percent of all snap beans come from three varieties of seeds.
72 percent of all potatoes come from four varieties of seeds.
69 percent of all sweet potatoes come from only one variety of seed.
60 percent of all dry beans come from two varieties of seeds.
56 percent of all soybeans come from six varieties of seeds.
53 percent of all cotton comes from three varieties of seeds.
50 percent of wheat comes from nine varieties of seeds.

RECENT NORTH AMERICAN SEED COMPANY PURCHASES (JUST A FEW)

New owner and seed company

International Telephone & Telegraph—Burpee; O. M. Scott & Sons.
International Multifoods—Baird, Inc.; Lynk Brothers.
Cargill—Dorman Seeds; Krocker Seeds; PAG.
Celanese—Cepril, Inc.; Joseph Harris Seed Co.; Moran Seeds.
NAPB (Olin and Royal Dutch Shell)—Agripro, Inc.; Tekseed Hybrid.
Occidental Petroleum—Ring-Around Products.
Pfizer—Clemens Seed Farm; Jordan Wholesale Co.; Trojan Seed Co.; Warwick Seed Co.
Purex—Advanced Seeds; Hulting Hybrids.
Union Carbide—Ferry Morris Seed Co.; Keystone Seed Co.
Upjohn—Asgrow Seeds; Associated Seeds.
Anderson Clayton—Paymaster Farms; Tomco-Genetic Giant.
Central Soya—O's Gold Seed Co.
Ciba-Geigy—Funk Seeds International; Louisiana Seed Co., Stewart Seeds.

FOX, ARK., *June 4, 1980.*

Hon. DONALD STEWART,
Chairman, Subcommittee on Agricultural Research and General Legislation, Agriculture Committee, U.S. Senate, Washington, D.C.

DEAR SENATOR STEWART: I would like to submit the following written testimony on S. 23, the 1980 amendments to the Plant Variety Protection Act.

S. 23 does nothing to stem the involvement of multi-national seed corporations in the seed industry or the decrease in the number of plant varieties available to the farmer. Indeed, by extending patent protection to six common vegetables and adopting a patent period identical to that used abroad, the legislation would only facilitate this process.

To substantiate this statement, one has only to point to the impact that the 1970 law has had on the seed industry.

Although the law bears the description "variety protection," its purpose has been to actually, decrease the number of new plant varieties developed and to pave the way for control of the seed industry by large corporations.

In testimony before the House Agriculture Subcommittee on Department Investigations, Oversight and Research, botanist Gary Paul Nabhan noted that the total number of newly-recognized varieties reached its highest point in 1968, two years before the passage of the "Plant Variety Protection Act." He noted that the leveling-off in the development of new varieties is due to the takeover of regional companies by multinationals "that are not interested in diversity."

The only increase has been registered in the ranks of huge corporations that have been led by the prospect of big profits to enter the seed business. ITT now owns Burpee; most of the other family-owned business are also under the umbrella of larger corporations.

Corporations, likewise, seem to be the primary beneficiaries of the new patent protection. A study by the Graham Center at North Carolina indicates, for example, that four "big names" together accounted for 79 percent of all patents awarded for beans. (These are Sandor, Union Carbide, Upjohn and Purex.)

We could also oppose the 1980 amendments by pointing to Europe, where control of unwanted varieties has been taken to its (illogical?) conclusion. Here, in large part because of the difficulties involved in enforcing patent rights, there are laws on the books to outlaw some non-hybrids.

Dr. Erna Bennett of the United Nations projects that 75 percent of current varieties will be extinct in European countries that have enacted such laws as soon as 1991. This statement has been endorsed by Agriculture Secretary Bob Bergland.

(Dr. Bennett stands by her statement, in the face of attempts by the American Seed Trade Association to discredit it.)

Secretary Bergland accepted the prospect that 75 percent of European varieties could be extinct calmly, apparently assuming that this process would weed out "obsolete" varieties.

Resistance to local pests and weather problems will, in all likelihood, disappear with the "obsolete" plants. In its place we will have a uniform susceptibility to disease, infestation and weather-related failures. Surely, our memories are not so short that we've forgotten the 1970 corn blight, a disease that wiped out half of the southern corn crop and that the National Academy of Science has attributed to genetic uniformity.

Will it take a disaster of nationwide (or global) proportions before our leaders awaken to the threat of genetic standardization?

The impact of genetic uniformity is irreversible Congress must act immediately to preserve the dwindling genetic heritage that is available to us.

it is unconscionable for Congress to consider legislation that would serve to narrow our genetic pool without giving adequate consideration to the consequences of such a measure.

I urge the Senate Agriculture Committee to put aside S. 23 until it is prepared to give in-depth consideration to the problem of genetic uniformity. I would hope that any future legislation that deals with plant "variety protection" would provide an effective means of storing, distributing and propagating seeds that are in danger of extinction. Current efforts, at $35,000 a year, are underfunded. They would also be better performed by non-profit organizations that have strong links with farmers themselves, such as the Graham Center, the Seed Savers Exchange, and the Ozark National Seed Order Company.

It is interesting to note that the influence of the large soup-making firms was powerful enough to influence Congress to exempt six soup vegetables in 1970. I hope this is not an indication that the large corporations wield enough power in 1980 to persuade Congress to turn its back on the problem of genetic uniformity.

Thank you.

FRAN FULTON.

FOX, ARK., *June 10, 1980.*

Senator DONALD STEWART,
Chairman, Agricultural Research and General Legislation Committee,
U.S. Senate, Washington, D.C.

DEAR SENATOR STEWART: This letter is in reference to the beginning of hearings by the Senate Agriculture Committee on or about June 17, 1980 dealing with Plant Patenting Proposals, Senate bill (S. 23). The bill intends to extend and strengthen to 18 years of patent protection plant material previously protected by the Plant Variety Protection Act of 1970. I am not familiar with the provisions of the Act of 1970 nor with the proposed additions or extensions in the Senate bill S. 23 of 1980. I am very familiar with plants, food supplies (commercial and homestead), recent history of plant genetic material, world food supply, and biblical prophecy dealing with famine caused by natural and supernatural catastrophy.

There is a danger in modern worldwide agriculture—the proliferation of high yielding hybrid plants providing the bulk of the world's food supply. These plants are marvels of genetic engineering and research—the best modern man can do to increase the yield for a given acreage or climatic situation. These hybrids are careful crosses of two specially selected parents—an effort that involves much time and expense. The men and/or corporations that find that one out of a thousand desirable hybrid deserve to be repaid for their efforts and deserve all the protections of any Plant Variety Patenting Act, providing that Act also protects the rest of the world from any intentional or unintentional control, shrinking, or failure of a major part of the world's food supply. This can easily occur locally, regionally, or even hemispherically through the agency of man, natural forces, the devil or God.

Logically, since hybrid food plants have larger and sometimes better yields they also put greater demands on the soil and on human sources of energy to replenish the soil (chemical fertilizers, water, and humus in the form of compost). The use of hybrid plants also entails the more prominent use of associated pesticides, fungicides, and herbicides to assure crop protection and uniformity of harvest. Thus carefully grown and protected, the hybrid crop is now ready for harvest, usually by large and technically sophisticated machines. This highly technical, highly intensive, Western method of agriculture produces tremendous quantities of high quality food but not in the Third World Nations where most of it is needed. It is too expensive, in poorer and in tropical and subtropical areas, to raise the modern superhybrid crops due to excessive competition of native "weed" plants, pests, and diseases. There are small areas that have raised large yields of hybrid rice and a few other staples crops native to Third World Nations but they have been intensively supported by their governments and Western technology. Without support and expense and extensive effort hybrid crops cannot be grown throughout the world as easily as they are grown here in the West (especially the United States). We are the most technically advanced agricultural nation in this world but we must not be led astray by what we have done and think we can continue to do. We must remain highly diversified.

Since the beginning of this last century the agricultural nations of the West, especially the United States, has reduced the number of varieties of plants to 5 percent of what it was a scant 80 years ago. This statistic refers to that plant material that is used in the commercially produced food supply—much of the other 95 percent is probably kept alive by small suppliers of vegetable seeds and small growers of vegetables in the private and public sectors of our food growing society (home gardeners, homesteaders, wildlife managers, environmental botantists, agricultural experiment stations and associated biologists of all sorts).

God, or natural forces if you prefer, provided man with a tremendous variety of both animal and plant genetic material. Much has been said about endangered species of animals—less about endangered plants. Do we have the right to limit the number of food plant varieties by unlimited hybridization? Are hybrids always better, to the exclusion of open-field pollinating varieties? I think not. Self pollinating and freely hybridizing plants have been the backbone of the world's food chain for thousands, if not millions of years. These non-hybrid (non-human hybrid) plants have managed to survive every test of survivability that the vagaries of nature could provide (floods/droughts, diseases, pests, fire, heat and cold) and came out alive and flourishing for man to choose which he prefered for his food supply. Hybrids are good and self-pollinated plants are good. Both can live together but not if man makes laws that limits one in preference to another. Both should be propagated equally—both should be protected by law equally, to provide those nurturing them with a profit for their efforts. Non-commercial users or producers of plant varieties should be allowed to do as they wish for their own food supplies for this is a basic human right. Such freedoms and such responsibilities will lead to a continually large gene pool of food supply plant varieties for the eventual protection of mankind.

If there is ever a plague of pests or various plant diseases whether a blind act of nature or a purposeful supernatural act the first part of our food supply to fail will be the less resistant hybrid crop plants. In fact the only real fault of hybrids is their succeptibility to plant diseases (fungal, viral and bacterial) and the lack of resistance to insect attack. Plant geneticists are continually trying to breed buck hybrids to the heartier, self-open-pollinated varities of crop plants they were originally hybridized from.

This suggests that everyone knows that non-hybrid plants must be maintained as an important part of our food supply if only to provide genetic material for hybrid plant experiments. I maintain that non-hybrids must actively be maintained in quantities capable of replacing hybrids in food supply production should there be wholesale failure of hybrid plants or genetic material, as has happened several times in various places in the United States in recent years. These stocks of seed should be maintained in various places by various organizations both public and private, both commercial and non-profit, both professional and amateur. It should be made profitable for commercial seed producers to *obtain* and *maintain* patents for varieties of plants they develop in both hybrid and open pollinated forms, if not mandatory in both forms. They should be convinced of the necessity of nearly equal supplies of hybrid and non-hybrid food crop seeds. As a last resort, God has provided within the uncultivated areas of the world many near relatives of our major food crop plants should we fail to keep our chosen varieties in sufficient diversity. If man fails mankind nature won't, but meanwhile many people will suffer needlessly through the evil intent of those wishing to control world food supply or unintential ignorance on the part of those unwilling or incapable of understanding the danagers present in producing food for our whole world. God gave us diversity because God knows what can go wrong—man must learn that one lesson or pay a dear price for ignorance.

Should you wish to contact me—feel free to do so. Should you wish me to attend any of your committee's functions or hearings—I am free to do so. Please send me copies of: (1) Plant Protection Act of 1970, and (2) Plant Patenting Proposals, S. 23 of 1980 if they are available. Thank you for any trouble on my behalf and may God be with you—you will need His help with this problem.

STEVE DANON.

STATEMENT OF KENT WHEALY ON BEHALF OF THE SEED SAVERS EXCHANGE, PRINCETON, MO.

I am Kent Whealy repreesnating the Seed Savers Exchange, an organization of several hundred vegetable gardeners in the United States and Canada. For the last five years, we have worked to save old vegetable varieties from extinction. As these living "heirlooms" pass away with our older gardeners, or are dropped from commercial availability and eventually become extinct, we lose forever irreplaceable genetic characteristics which may be desperately needed in breeding future foods crops. We view this amendment, S. 23, as a direct threat to our organization's work.

I have closely watched similar legislation over the last few years in the Common Market countries, then England, then Canada and now here in the U.S. This July full implementation of similar legislation in England will "outlaw" and bring eventual extinction to over 2,100 fine old vegetable varieties. Dr. Erna Bennett of the U.N.'s Food and Agriculture Organization in Rome estimates that by 1991, over three-quarters of all vegetable varieties now grown in Europe will be extinct because of these patenting laws. Secretary of Agriculture Bob Bergland confirms that "the prediction that by 1991 three-fourths of all vegetable varieties grown now will be extinct may prove to be correct. Obsolete varieties are being replaced by improved varieties adapted to extended areas of agriculture."

The truth is that these varieties are not obsolete and their extinction can easily be brought about here in the U.S. without outlawing them. Thousands of unique vegetable varieties have been dropped from seed catalogs during the last two decades, not because they were inferior or obsolete, but because it is only profitable for the large seed companies to stock the varieties which sell the most. Recently here in the U.S. and in other countries considering or passing such legislation, large multinational chemical and drug corporations have been buying up seed companies at an incredible rate anticipating the profits such legislation will bring. The resulting conglomerates have been introducing almostly exclusively hybrid pseudo-varieties because they are highly profitable since farmers or gardeners can't save their own seed. While hybrid corn is much more productive, standard tomatoes and peppers are little different from their hybrid counterparts. Dr. Ernest Kerr of the Simcoe

(Ontario) Research Station says, "We've tested a thousand or so different hybrids, but none of these are equal to the best standard varieties of tomatoes." But the gardening public blindly believes the hybrid's claims or simply has to choose from what little is now available.

It is essential that we inventory all food varieties that are now commercially available. Legislation should be passed immediately to require seed companies to annually submit such information. Only by doing this will we be able to assess which varieties are in danger of being lost. Such an inventory should be made publicly available so that it can be used by all individuals and organizations working to preserve germplasm resources. I am afraid that if the economy continues to decay, and I see no reason that it won't, many small seed companies will unknowingly be putting out their final catalogs this next winter. Massive bankruptcies of small seed companies would result in the wholesale destruction of thousands of locally adapted varieties. The continued rapid consolidation of the seed industry and the resulting large seed companies' bias in favor of hybrids will have the same inevitable result.

In a letter to one of my organization's members, Sen. Frank Church said there is really nothing to fear because "We now maintain a seed bank to preserve the gene pool." It really irks me when politicians or seed trade spokesmen point to the National Seed Storage Laboratory as proof that "we have the situation covered". Nothing could be farther from the truth. The USDA has not even had one full time plant explorer since 1970. The National Seed Storage Laboratory did not even receive a budget increase during its first 15 years of existence. Persons dealing with the Lab report that it is so under-funded and under-staffed that it is just now processing seed samples that it received in 1976. Irreplaceable one-of-a-kind breeding materials are literally dying on the shelf awaiting processing. Stored materials often reach the dangerously low germination rate of 40 percent before they are remultiplied. The facility, located on the campus of Colorado State University at Fort Collins, is located above ground with a huge nuclear munitions plant north of Denver on one side and a SAC Air Force Base near Cheyenne on the other side. In this age when a nuclear war is not unlikely, that is absurd. Our country's leaders convene to consider this short-sighted, dangerous, greedy, special-interest legislation instead of quickly upgrading their committment to germplasm preservation, and then wonder why the people have lost faith in them. You should immediately appropriate funds to build an excellent underground facility capable of withstanding a nuclear exchange. And increase the Lab's funding to the point that it can do the essential job that it must do to insure continued U.S. leadership in agricultural production.

It is unthinkable to consider legislation which would allow private companies to "lock up" any food variety for 18 years. Such a system would place profit above preservation and would undoubtly lead to the extinction of food varieties and future plant breeding materials on a large scale. No one knows what qualities plant breeders will need in 10 years, let alone 100 years. The future adaptability and resistance of our food crops to insects, diseases, and changing environmental conditions depends on the amount of genetic diversity we are able to rescue at this time. Many factors have already lead to massive and irreplaceable losses of invaluable future breeding materials. We cannot afford to add this legislation to the list. If these soon-to-be-extinct varieties were animals or birds or fish, there would be an outpouring of condemnation that would bury this legislation. But these food plants are more valuable than anything else. They are scared.

STATEMENT OF GARY PAUL NABHAN

I am a concerned agricultural scientist with a master's degree in plant sciences; I am not representing any special interest group, corporation, agency or institution. I am familiar with the day-to-day workings of the seed business and plant conservation programs through collecting rare plant varieties for the USDA, universities, botanical gardens, small locally-owned seed companies, and for international agricultural programs. My major concern is that the USDA has misrepresented to you and to the general public how the 1970 Plant Variety Protection Act (PVPA) functions, as well as its impact on plants and people.

In an April 18, 1980 Legislative Update on S. 23 and H.R. 999, the USDA asserted that the PVPA is accomplishing the objective of encouraging "the development of more new varieties so that total genetic diversity among commercially available varieties will be expanded." This most basic assumption—that the PVPA encourages genetic diversity—is faulty to the point of being deceptive. Genetic diversity does not simply mean the number of available varieties; it is a scientifically measurable factor that takes into account the differences between varieties—in other words, the distinctiveness of the genetic make-up of each variety—as well as the variation within the gene pool as a whole.

Let me show you the difference between true genetic diversity and numbers of varieties by citing an example from the 1972 National Research Council Report on Genetic Vulnerability of Major Crops. This report informs us that for dry beans, "two commercial types, the Michigan navy bean and the pinto, account for 60 percent of all dry beans grown in the United States. Four navy beans, Sanilac, Seaway, Gratiot, and Seafarer, account for almost all the acreage of this class. All four navy beans, despite complete breeding pedigrees, derive over 90 percent of their germ plasm from the previously widely grown navy variety Michelite. It is clear, therefore, that, for a considerable part of the edible dry bean acreage in the United States, annual production rests upon a dangerous small germ plasm base."

This statement indicates that there is great redundancy in the genetic make-up of modern commercial plant varieties. The four varieties noted are hardly an improvement in genetic diversity, if over 90 percent of their genes are from one parent. They all share the same gene for resistance to common bean mosaic virus—it is likely that if the virus ever overcame this one gene's strategy for resistance. All the acreage in these four varieties would be similarly vulnerable to crop failure.

The upshot of this is that the PVPA simply encourages the proliferation of named, visibly distinct crop varieties, but that these new varieties can all be derived from the same limited genetic base. I urge you to require the USDA to quantify the increase in genetic diversity, if any, that has resulted from the 1970 Act, before asserting to any one else that this Act has indeed encouraged genetic diversity. Before extending this Act, USDA geneticists should be required to evaluate the number and frequency of alleles within certified varieties as opposed to those in commercially available varieties as a whole, including uncertified ones. Looking at these measurable indicators of genetic diversity in both what was available to the public prior to 1970, and in what is available now, is the only way to determine whether or not the 1970 PVPA has affected genetic diversity in commercial crops.

To summarize my first point, all claims by the USDA and others that the 1970 Act has encouraged genetic diversity are as yet unfounded. It is clear that as modern plant breeding has been practiced over the last 50 years, there is great redundancy in new varietal releases, and that very few add to the available genetic diversity.

The USDA has also stated that "to receive a certificate of protection, PVPA requires the variety to be distinct from all varieties. The difference must be objectively described." From my conversation with USDA officials, I realized that they emphasize that these objective differences are primarily in what the plants or their seeds look like. It is not clear to me and to others if a plant that is biochemically distinct but visually identical to a previously certified variety could also be certified. I urge you to request that USDA scientists clarify this point. For instance, if a plant breeder developed a sugar snap pea that consistently had 25 percent higher protein content than the Gallatin Valley Seed Company's sugar snap pea, but was in all other ways indistinguishable from the certified variety, could it too be certified? It appears to me that the PVPA encourages superficial visible differences between varieties, rather than providing a stimulus for more profound developments, such as increased nutritive value in vegetables.

Whereas the PVPA does make provisions for preserving 2,500 viable seeds of each certified variety in the National Seed Storage Laboratory, it does not make any provisions whatsoever for the older varieties that may or may not become obsolete, inadvertently or otherwise, as the new variety becomes distributed. The point here is not to say that the PVPA, the USDA or seed companies are causing the extinction of older varieties; I feel that is a misreading or distortion of a complex issue. Instead, let us recognize that many old, valuable varieties are going extinct, and do something about it before it's too late. If we are to certify plant varieties, then it should be required that 2,500 seeds of each variety potentially replaced by the new certified variety are also sent to the National Seed Storage Laboratory for preservation. Since this facility has never received adequate funding for storage or for regrowing stored varieties periodically, I propose that 10 percent of each certification fee be set aside for the specific purposes of conserving traditional crop varieties, obsolete commercial varieties, wild relatives of crops, and minor crop species, as well as for enlarging the capacity of the Laboratory and its field operations.

Finally, be aware that there are many corn, bean and squash varieties that have been grown within the present-day U.S. boundaries for hundreds of years that are now going extinct. For instance, Southwest Indian farmers have the last few handfuls of seeds of some crops that are resistant to blight, nematodes and heat, and that have high nutritive value. There is no full-fledged program to keep alive crops native to our American soil! The National Research Council's 1978 report on Conservation of Germ Plasm Resources noted that there are many other plant resources that " 'fall between the cracks' of existing commitments, such that no one takes full responsibility for facing up to them." Why are we filling up the Seed Storage Laboratory with redundant collections of certified varieties, when we haven't made an effort to preserve the basic genetic foundation upon which future agriculture rests? Our traditional crops and their wild relatives—which have evolved and diverged into distinct entities over millenia are and will always be the real key to genetic diversity and a healthy agricultural system.

STATEMENT OF FOIL W. MCLAUGHLIN, ASSOCIATION OF OFFICIAL SEED CERTIFYING AGENCIES, RALEIGH, N.C.

Mr. Chairman, members of the Committee, my name is Foil W. McLaughlin of Raleigh, North Carolina and a Director of the Association of Official Seed Certifying Agencies. This Association is an organization of state seed certifying agencies. There are 41 members representing as many states. These agencies are designated in each state to officially certify seed as meeting specified minimum variety purity standards. Seed certification, briefly defined, involves the use of seed production and conditioning standards in combination with a system of record keeping, field inspections, and seed inspections to protect the genetic purity and maintain the genetic identity of crop varieties. I should add that seed certification is a voluntary program involving hundreds of seed growers (farmers) and seedsmen in each state.

I appreciate the opportunity to present to you this Association's views concerning S. 1580 and related bills.

These bills would amend the Plant Variety Protection Act so that the Act would be extended to protect okra, celery, peppers, tomatoes, carrots and cucumbers which are exempted under the Act. Other proposed amendments to the Act include clarifying words and other minor changes which would make no significant regulatory impact. The Association of Official Seed Certifying Agencies supports S. 1580.

In 1970, when Congress considered and passed the bill which became the United States Plant Variety Protection Act, the same bill amended the Federal Seed Act. This amendment added Title V—Sale of Uncertified Seed of Protected Varieties (Section 501). This section of the Federal Seed Act prohibits the sale of uncertified seed of varieties protected through the "certification option" of the Plant Variety Protection Act. This certification option in Section 83 of the Plant Variety Protection Act permits the owner of a variety who is seeking protection to elect to have his variety sold only as a class of certified seed.

These provisions make it unlawful "to sell" seed not certified by an official state seed certifying agency when the certificate of plant variety protection under the Plant Variety Protection Act specifies that seed of the variety may be sold only as a class of certified seed.

There has been concern expressed among growers of certified seed, seed control officials (Federal and State), seed certifying agencies and the seed industry that Section 501 of the Federal Seed Act should be amended. Such an amendment should make it unlawful not only to "sell" as the Act now provides but to "offer for sale or advertise" protected varieties which involve the "certification option" in the seed production and marketing program.

Therefore the Association of Official Seed Certifying Agencies supports the Amendment which you are considering today which would amend Section 501 of the Federal Seed Act (53 Stat. 1275).

The proposal would not only apply to "sales" but in addition, would extend the prohibition to seeds "offered for sale or advertised". It is the intent to make it unlawful to sell or offer for sale or advertise seed of a variety protected through the certification option (Section 83, Plant Variety Protection Act) unless the seed are certified and labelled with the variety name. With this amendment, seed of protected varieties with the certification option would be marketed in a more orderly manner in the United States or in interstate or foreign commerce.

This amendment to the Federal Seed Act has been reviewed with personnel of the U.S. Department of Agriculture, and it is my understanding that the Department supports this amendment.

Mr. Chairman and members of the Committee, thank you for the opportunity to express our Association's support of the bill. We urge you to give favorable consideration to these amendments.

STATEMENT OF KENNETH A. DAHLBERG, ASSOCIATE PROFESSOR POLITICAL SCIENCE, WESTERN MICHIGAN UNIVERSITY, KALAMAZOO, MICH.

My interest in the proposed amendments to the Plant Variety Protection At of 1970 stems from my long concern with global agricultural and environmental trends and their broad policy implications for the industrial and the developing countries.

This statement is presented on behalf of the Sierra Club, a voluntary organization concerned with conserving the basic biological endowments of the biosphere and having a membership of over 180,000. I serve as a member of the International Committee of the Sierra Club.

To appreciate fully the importance of the issues raised by the 1970 Plant Variety Protection Act and the proposed amendments, it is necessary to see them in the context of the broad trends of the past century and to examine the serious risks associated with them. After examining these, the statement will go on to show what the amendments (as well as the original Act) increase these risks well beyond the point of any compensating benefits.

TRENDS OF THE PAST CENTURY

When one looks at agriculture over the past century from a global perspective, four fundamental shifts or transformations are apparent.[1] These are: (1) the increasing destruction of forests and the expansion of agriculture into new, and now increasingly marginal, lands; (2) the shift of populations from the rural to the urban and industrial sectors; (3) the shift in farming from a vocation based upon renewable resources; and (4) a change in rural structure from one of numerous decentralized and largely self-sufficient family farms to one of fewer farmers who, whether large or small, depend almost totally upon complex centralized infrastructures and institutions for their inputs, maintenance and sales. This has been the general pattern among the industrial countries (with obvious individual variations). It also threatens to become more and more the pattern among the developing countries, as industrial agriculture—better known as the "green revolution"—is adopted and promoted by the elites of these countries. I used the terms "threatens" because it is my carefully considered conclusion that each of these trends has reached—and most likely exceeded—its sustainable limits and that further movement in these directions severely threatens both the countries involved and the global ecosphere. I am not alone in this view, as I shall show when I discuss each of these trends in somewhat greater detail.

1. The destruction of forests and the expansion of agricultural land. While the expansion of agricultural land is only one of several causes for the loss of forests, the loss—especially of tropical forests—has become so serious that various national and international task forces have been set up and have made reports. Both the U.S. Strategy Conference on Tropical Deforestation and the recently released World Conservation Strategy stress the need for major new initiatives to preserve the world's forests and to try to encourage reforestation.

2. Population shifts from rural to urban areas. While the industrial countries had the luxury of having their shift occur over a period of more than a century, the developing countries have been suffering from the double pressures of rapid population growth and dramatic migrations of people to the urban areas, where they are often crowded into miserable slums. Virtually all development analysts agree that every effort should be made to slow this rush of people to the cities. The best way to do this would appear to be to improve the life of peasants in the rural areas through development programs which enable them to meet more of their own needs, rather than displacing them through the introduction of capital- and energy-intensive modes of agriculture. In the U.S., there has been some movement of people back to the rural areas, and this can be expected to increase as energy price increases, with their multiplier effects, funnel through our energy-inefficient food system.[2]

3. Energy-intensive, fossil fuel agriculture. The demands of industrial food systems for huge amounts of nonrenewable energy have led many thoughtful observers to conclude that our present system is not sustainable even at current population levels, much less at those projected for the year 2000. As the Pimentels point out:

"Another way to explore the dependency of food production on fossil energy expenditure is to calculate how long it would take to deplete the known world reserve of petroleum if a high protein/calorie diet, produced using U.S. agricultural technologies, were fed to the entire world population. . . . Assuming petroleum were the only source of energy for food production, and all known petroleum reserves were used solely for food production, the reserve would last a mere 11 years."[5]

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[1] These are discussed more fully in Chapter 5 of my book, "Beyond the Green Revolution: The Ecology and Politics of Global Agricultural Development" (New York and London: Plenum Press, 1979). See also Lester R. Brown, "The Twenty-Ninth Day" (New York: W. W. Norton, 1978).

[2] John Steinhart and Carol Steinhart, "Energy Use in the United States Food System", Science 184 (April 19, 1974), pp. 307–16. See also G. Leach, "Energy and Food Production" (Surrey, England: IPC Sciences and Technology Press, 1976).

Clearly, the present U.S. system cannot be used as a model, even for future U.S. food production. The movement toward new systems that are based on renewal resources and have lower energy requirements will be difficult—but necessary if we are to avoid some sort of major collapse in the longer term. In implicit recognition of this, the USDA has recently sponsored studies on organic farming methods to examine and evaluate their greater use of renewable energy resources. Another major area where changes can be made is in the high protein/calorie diet of most Americans—a diet that is increasingly recognized as unhealthy.[6]

4. Changes in rural structure. The trend toward more large farms producing large crops which are then fed into a complex and centralized processing, packaging and distribution system is the source not only of many of the energy inefficiencies described above, but also the source of frustrations for both farmers and consumers over their inability to influence more than slightly what happens to their livelihood and/or staff of life. Like the monocultures which are increasingly grown there, the whole rural structure is being simplified and thus becoming subject to wide swings and pressures from external events such as oil embargos, grain embargos, market controls, climate shifts, etc. Equally, such simplified systems require a high degree of supervision, maintenance and intervention from the outside—something that the members of this committee must be well aware of. Again, the USDA has begun to explore some of the ramifications of changes in rural structure, but in much more narrowly defined terms.

RISKS ASSOCIATED WITH THE ABOVE TRENDS

As suggested above, each of the trends of the past century is not only unsustainable but has various serious risks associated with it. In addition, when taken together these trends carry with them fundamental risks to the global ecosystem and to the evolution and availability of plant species upon which humankind depends. In dealing with future risks, it is important to be able to sort out broader, more fundamental risks from narrower and less basic risks. As I have argued elsewhere:

"To make intelligent policy for the future, we must first ascertain those broad evolutionary limitations, parameters and goals to which we must be sensitive if we are to survive as a species; next, we must examine the limitations and parameters facing us in the next century and we must establish our goals for this long period, keeping in mind that these goals must be consistent with evolutionary limitations and goals. Only then can we turn to specific policy recommendations for the relative short term of the coming decade."[7]

There is general scientific support for the idea that the earth's genetic resources must be husbanded at all costs and that the increasing rate of loss of species is a fundamental evolutionary threat to humankind. In this sense, all other programs and priorities must yield in the face of a conflict between them and genetic conservation. If this applies as a generalization for all species, it must be even more the case for the plant and animal species upon which we directly depend.

Perhaps a few analogies will help to clarify the argument. One draws upon the distinctions made in law between the procedural requirements for amending the Constitution, those for legislation and those in administration. The procedures required to amend the Constitution are complex and demanding, the underlying idea being that the basic fabric of society should not be changed on the whim of the moment, at the demand of one powerful group or without widespread and full debate of all the implications of the proposed amendment. In effect, the burden of proof is placed upon those who would alter the basic operating rules of society. In this sense, actions which threaten to reduce or alter the basic genetic fabric and endowment of the ecosphere should be required to meet the equivalent of the constitutional test—that is, the proposed action, whether legislative or administrative, public or private, should have to be discussed widely, should be subject to stringent procedural requirements and safeguards and should have to demonstrate clearly that the proposed changes are required and that any potential risks of genetic simplification can be fully overcome. In this sense, the Plant Variety Protection Act of 1970—passed in the rush to adjourn for the Christmas recess—cannot be said to have passed the "constitutional" test to which it should have been submitted.

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[5] David and Marcia Pimentel, "Food, Energy and Society" (New York: John Wiley and Sons, 1979), pp. 137–138. See also Russell E. Anderson, "Biological Paths to Self-Reliance" (New York: Van Nostrand Reinhold, 1979).

[6] Hellen Linkswiler et al., "Calcium Retention of Young Adult Males as Affected by Level of Protein and of Calcium Intake", Transactions of the New York Academy of Sciences, Vol. 36, No. 4 (1974), p. 333. USDA Press Release 788–79, "High-Protein Diet Related to Bone Disorder in Rats" (April 5, 1979). Robert E. Morrow, "Relationship of Diet to Osteoporosis: A Review of the Literature", paper delivered at the Longevity Research Conference, Santa Monica, California (January 11, 1979).

[7] Dahlberg, "Beyond the Green Revolution," p. 139.

A second analogy may help to show how our evolutionary options are reduced through the simplification of basic systems. In the 1920's and 1930's, the electric trolley systems in many cities were bought out by large automobile companies and eventually replaced by buses. Simultaneously, the number of automobile companies was reduced, as several large firms came to dominate the industry. The result has been a transportation system which is heavily weighted in favor of large private corporations and against the revitalization of public mass transit systems. This is a fair analogy for what is likely to happen as large companies take over a number of seed companies: the number of options available to the smaller and poorer farmer will be reduced as prices go up on a smaller range of products designed primarily for larger and wealthier customers. To make a complete analogy, however, one would have to include the basic difference between biological and mechanical systems: i.e. if the transportation system operated as a biological one, then there would be no chance today to revitalize trolleys or other surface rail mass transit systems—the species would have become extinct. And all the king's horses and all the king's men. . . .

The above discussion suggests another basic risk associated with current trends, one which, if not fundamental in the evolutionary sense, is certainly basic to our democracy.[6] [7] [8] [9] [10]

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Digression leads to an important point: that talk of plant patenting having something to do with solving the problems of world hunger is largely rhetorical. The real problems of world hunger are complex and go far beyond seed patenting, although many observers are increasingly arguing that it will make the problem more serious by increasing the market control of the multinationals in the developing countries.

The second possible benefit, that of describing, cataloguing and storing the protected varieties is one that clearly flows from the legislation. While this is a benefit, it must be weighed against the losses of non-protected traditional varieties which result from a system which is based increasingly upon the mass marketing of a relatively narrow range of varieties controlled by a few large corporations.[11] The matter reaches well beyond this. One must ask how much these losses reinforce the trend toward an increasingly simplified and unstable agricultural system and rural structure—something that obviously derives from a wide range of government and corporate policies, questionable economic assumptions and technological developments.

The third possible benefit, that the amendments will facilitate the U.S. joining UPOV, assumes that U.S. membership is a benefit. Certainly, membership will benefit the large seed companies by including them in an international system which is clearly structured to their advantage; whether membership will provide benefits to either the farmer or the public is doubtful, for reasons which will be discussed below. Again, the question arises whether Congress should pass legislation simply because it will be advantageous to certain commercial interests.

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[6] World Conservation Strategy, Section 17.1. It should be noted that the Strategy—a joint project of the International Union for the Conservation of Nature and Natural Resources, the United Nations Environment Programme, and supported by the World Wildlife Fund—represents three years of intensive effort involving governments, international agencies and more than 700 eminent scientists and experts from over 100 countries. It reflects an unprecedented agreement among world leaders and the world's scientific community on how to ensure that the earth's natural resources are safeguarded not only for ourselves but for future generations.

[7] World Conservation Strategy, Sections 17.11 and 17.12.

[8] P. R. Mooney, "Seeds of the Earth: A Private or Public Resource?" (Ottawa: Inter Pares for the Canadian Council for International Co-operation and the International Coalition for Development Action, 1979), pp. 81-87.

[9] Jennifer Bennett, "The Patented Seed: Another Step Toward Corporate Agriculture?" Harrowsmith, Vol. IV, No. 2 (September 1979), pp. 46-[illegible], 84-86.

[10] Cynthia Hewitt de Alcantara, "Modernizing Mexican Agriculture: Socio-economic Implications of Technological Change 1940-70" (Geneva: United Nations Research Institute for Social Development, Report No. 76.5, 1976).

[11] For a full discussion of these issues and an analysis of other ways in which our global stock of germ plasm is threatened, see the two major studies by the National Academy of Science: "Genetic Vulnerability of Major Crops" (1972) and "Conservation of Germplasm Resources: An Imperative" (1978).

Let us now turn to the long-term risks and costs which may flow from this legislation. These should be understood as involving three levels. First, there are the evolutionary risks described above—the risk of losing irreplaceable plant genetic materials and the risk of simplifying and/or destroying the reservoirs of all manner of germ plasm to the point where both agriculture and life itself is threatened. As has been stressed, the seriousness of this threat requires that proponents of plant patenting have the burden of proof placed on them to show that such patenting will in no way contribute to or reinforce the trends which so threaten us.

A second level involves those long-term risks associated with the social, economic and political implications of the four broad trends identified earlier. It would appear that these amendments and the legislation itself tend to reinforce these unsustainable trends. By reinforcing these trends, rather than moderating or starting to reverse them, such legislation increases the risk of some sort of drastic collapse or disruption. At this level, it is also clear that the modest public benefits (as distinct from the large private benefits) do not come close to counterbalancing the very large public and private risks involved in reinforcing the four trends.

A third and more modest level involves a consideration of what experience from other regions, as well as other sectors, suggests about a patent system as applied to plants. The experience in Europe is certainly not encouraging. Their plant patenting system is set in the larger framework of the Common Agricultural Policy, a bureaucratic nightmare that richly rewards large producers at the expense of small farmers and the consumer. The cost of the CAP is so high that Britain is currently seeking to renegotiate the whole of its budgetary commitment to the EEC. Within this complex, large-producer-oriented system, the so-called "Common Catalogue" has been developed. Based upon "national lists" prepared by each EEC member, it has generated much discussion because of its so-called "illegal vegetable" aspect. That is, after June 30, 1980, it will become punishable to sell vegetable varieties not on the list. The fine in Britain will be up to £400. What is less discussed is what it takes to get a variety on the list and keep it there. In the U.K., an unlisted variety must undergo lengthy tests at a cost of roughly £1000. Once on the list, there are annual fees of £70 for registration and £300 for inspection. Clearly, such provisions discriminate against both the small seed company and the small farmer or gardener. Similarly, the $750 administrative fee required for protection under the Plant Variety Protection Act discriminates against the small breeder and seed company. Even more serious are the consequences for the loss of genetic diversity. Erna Bennett, a Genetic Conservationist at the FAO, has stated:

"It is completely unavoidable that the application of such a policy as is embodied in the EEC Common Catalogue results in considerable genetic impoverishment. It is also inevitable that it results in poorer and less nutritious vegetables, even if they may acquire in the process certain aesthetic elegance. It is my view that this is a gross distortion of plant breeding and agricultural objectives. It is also a dangerous policy. . . . We can expect a loss of three-quarters of the genetic diversity of Europe's vegetables within a decade. Prediction is always uncertain, but let us remember that even without the EEC Common Catalogue, the last 30 years have seen an equal amount of genetic loss, or even greater, in some species of vegetables. Now, with legislative force to aid the process, it would be foolish to hope for anything less catastrophic." [illegible]

The distinguished British agriculturalist, Sir Joseph Hutchinson, has concluded that: "in the interest of economic advance we have established varietal rights legislation, and in the EEC we are engaged in making sure that none but the most advanced varieties are allowed to be sold in the area, thereby very greatly restricting the diversity that is available to us. We are in fact selling our birthright for a mess of pottage." [illegible]

Two conclusions should be drawn from the above. One, that while the Common Catalogue may be a rather crude and abusive system, it follows logically from an agricultural system dominated by the commercial priorities of large producers and firms and the bureaucratic convenience of the Eurocrats in Brussels. Two, that the U.S. should be very cautious about joining an organization—the International Union for the Protection of New Varieties (UPOV)—that is dominated by these same European groups. No need for the U.S. to join has been advanced, other than

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[illegible] Erna Bennett, "Conserving Genetic Variability", Development Forum (November-December 1979), p. 2.

[illegible] Hutchinson, Proceedings of a Conference on "Conservation in Agriculture" (Oxford, 1976). Quoted in Mooney, p. 77.

bureaucratic convenience for USDA or commercial advantage for large seed companies. Food and Agriculture Organization (FAO) officials have expressed extreme caution about their relationship to UPOV, citing the ways in which UPOV restricts the free flow of genetic information and germ plasm and the grave risks for the developing countries resulting from the monopolistic practices which tend to flow from UPOV's protection of new plant varieties. In addition, UPOV's role in encouraging the patenting of other life forms needs to be closely examined.

Before concluding, I would like to point to the experience we have in a parallel industry where restrictive legislation, corporate concentration, heavy advertising and similar research questions arise—the pharmaceutical industry (which, not incidentally, is one of the major industrial sectors buying up independent seed companies). While there are obvious differences between different pharmaceutical companies in terms of their ethical behavior, the overall pattern is not one to encourage emulation in the plant variety field. Prices for protected items are normally much higher than those for generic equivalents; even so, high advertising budgets and intensive sales techniques still incline doctors to prescribe the more expensive products. In terms of the developing countries, the large drug firms have used them as human testing grounds for experimental drugs which require much more stringent procedures in the industrial countries. Also, they have continued to use the developing countries as a market for drugs which are either obsolete or have been shown to have risks unacceptable to industrial countries. Research has been directed to meeting the health needs of the industrial world, with little research having been done on such tropical diseases as river blindness, infant diarrhea, schistosomiasis, etc. Also, the focus has been on the somewhat better-off and easier-to-reach urban masses rather than on the rural poor. Clearly, the lesson for the plant variety field is to try to avoid such abuses—abuses which appear to flow primarily from corporate concentration and protective legislation covering patents, trademarks, proprietary information, etc.

As I have shown, there are strong scientific, Constitutional and practical grounds for rejecting the whole notion of plant patenting or protection. At a minimum, those who are proposing either legislation or actions which threaten our very evolutionary possibilities and options by reducing our common genetic heritage—particularly in the area of plant germ plasm, where we have the greatest scientific knowledge of both our resources and our dependence upon them—must have the legal and Constitutional burden of proof placed on them. I have tried to show that the proposed amendments, as well as the basic legislation, offer such extremely modest benefits as compared to the fundamental risks they pose that they should be withdrawn or repealed. That, of course, would be far from sufficient to address other causes of genetic erosion and loss. A much broader and more comprehensive review of policy and practice is called for. Indeed, an increasing number of books and reports argue that a complete re-conceptualization of industrial agriculture is what is needed—and soon.[illegible]

THE RESOURCES AGENCY OF CALIFORNIA,
Sacramento, Calif., May 2, 1980.

Hon. E DE LA GARZA,
Representative, U.S. Congress,
Longworth House Office Building, Washington, D.C.

DEAR MR. DE LA GARZA: Because a vigorous and diverse California agriculture is of such great importance to our State and the entire Nation, we would like to convey to you some of our concerns about H.R. 999, a bill that would amend the Plant Variety Protection Act of 1970.

We feel that H.R. 999, as it is now written, could have a profound effect on California producers in regard to the flexibility they now enjoy in selecting seeds, and on all of the Nation's consumers in regard to the wide variety of agricultural products available to them.

More important, however, we are concerned about what we see as an inexorable trend toward narrowing the genetic base of our agricultural crops. The consequences of this trend were previewed in 1971 when Midwest corn growers suffered massive losses to a virulent fungus disease to which the widely planted corn varieties had no defense, and for which there was no adequate control measure available.

[illegible] See especially Russell E. Anderson, "Biological Paths to Self-Reliance" (New York: Van Nostrand Reinhold, 1979); Kenneth A. Dahlberg, "Beyond the Green Revolution" (New York and London: Plenum Press, 1979); Norman Myers, "The Sinking Ark" (Oxford: Pergamon Press, 1979); and Robert Oelhaf, "Organic Agriculture" (Montclair, N.J.: Allanheld, Osmun, 1978).

While H.R. 999's potential for reducing agricultural gene resources is our greatest concern, other aspects of the bill also invite careful consideration. The key concern of the bill's proponents is protection of the proprietary interests of plant breeders and seed companies that invest large amounts of money in the development of new seed varieties for today's markets. The key concerns of the critics is that one consequence of the legislation may be to reduce genetic diversity, and hence increase vulnerability of our economic crops to insects and disease.

Because of the apparent close relationship between plant variety protection efforts and maintenance of genetic diversity, it seems appropriate that the latter issue be considered together with the former, and that plant variety protection efforts in fact be coupled with a strong, and adequately supported program for preservation of gene pool diversity.

Many scientific authorities, including the National Academy of Sciences in its 1972 report, "Genetic Vulnerability of Major Crops," and Nobel laureate Norman Borlaug, have criticized the trend to shrinking gene pool diversity. The tendency to plant fewer varieties of a given crop has been, in some ways, a logical response to the economic pressures facing farmers and seed companies to strive for the highest yielding or most profitable seed varieties; however, the consequences of such specialization for vulnerability of crops to pest depredations is what concerns these specialists.

We are all familiar with complaints that the taste and nutritional quality of disappearing order varieties, especially of vegetables, was superior to that of newer strains which have been selected in large measure for traits, such as ease of harvest and marketability, as well as yield and hardiness. But the more fundamental question concerns the viability of an increasingly specialized agriculture. The southern corn leaf blight of 1971 remainded us of the dangers of too narrow a range of varieties in a major crop. With half of the processing tomato acreage planted to a single strain, California might be similarly prone to massive crop losses. The seed industry's own programs are insufficient insurance against such losses. The National Academy of Science also has expressed concern over damage to the gene pools of many crops over recent years, and the decline, rather than increase, in diversity of plantings of patented varieties since the 1970 law was enacted. While we recognize that the intent of H.R. 999 is "to increase research and species," there is dispute over whether it would in fact do so.

Attempts are underway to establish and maintain germ plasm banks, such as the federally sponsored facility at Fort Collins, Colorado. However, these efforts are insufficiently funded and may be themselves inadequate without maintenance of gene pool diversity in natural habitats.

Another trend that gives us great concern is concentration in the seed industry. It may be legislatively unwieldly to address this issue in the bill itself, but the problem is clearly connected with the subject of the bill and must be discussed at this time. The priorities of managers of multinational firms may not be the same as those of cautions Department of Agriculture officials or of most farmers. There is the possibility that management imperatives will force large seed companies, many of which are part of diversified conglomerates, to prune all but the most profitable product lines reducing the diversity available to the working farmer. More specifically, the acquisition of many seed companies by agri-chemical companies raises additional questions of what characteristics will be selected for inbreeding programs—disease resistance or fungicide dependence, for example. At a time when the U.S. Department of Agriculture and others are seriously examining ways to reduce agriculture's dependence on energy intensive chemicals, the impact of these acquisitions certainly ought to be discussed. Strictly speaking, it may be extraneous to this bill, but the issue is closely linked. The Agriculture Committee should hold hearings on the impact of concentration in the seed industry on genetic diversity—in advance of proceeding with H.R. 999.

Finally, we are concerned about United States' participation in the International Union for the Protection of New Varieties of Plants (UPOV). European members of UPOV are now engaged in developing a system of designating "legal" and "illegal" vegetables, based on whether or not vegetable varieties have been patented and are included in a "Common Catalogue" which designates which vegetable seeds can be legally sold.

We understand that there is a clear distinction between the patenting and listing programs, and that participation in UPOV does not require or indicate adopting lists of "illegal" varieties. Our fear remains that at some future time the United States may choose to rely on the same administrative convenience the Europeans moved to—that is, using the lists as a partial solution to the difficult problems of enforcing the patent legislation. This concern is heightened by the link of the patenting issue with concentration in the seed industry.

In light of these concerns, we urge that before acting on H.R. 999, the Congress and the U.S. Department of Agriculture take the following steps:

1. Expand, and adequately fund, the United States gene pool preservation program, and our relationship with related international programs. Recognize, and state, that the patenting program, with the prospect of gene pool shrinkage that it entails, carries with it the responsibility of providing these protections. Explore "living storage" of gene pool resources in natural and agricultural ecosystems, as well as in protected cold storage.
2. Initiate a study of the impact of consolidation in the seed industry, and of the integration of the seed and agri-chemical industries, on diversity and sustainability of agriculture in both developed and developing economies.
3. Assure the public, through a statutory guarantee, that the United States will not now or in the future seek to ban or otherwise restrict the development or protection of nonpatented varieties as is now the practice in parts of Europe.

We thank you for your attention to these matters and hope that H.R. 999 can be amended to reflect our concerns and the concerns of many others. The resolution of these issues could have a profound effect on shaping the world's future food supply. If the wrong decisions are made now, we may be depriving future generations of a resource that could be vital to their survival.

Sincerely,

HUEY D. JOHNSON,
Secretary for Resources.
PRISCILLA C. GREW,
Director, Department of Conservation.
ROBERT JU[illegible]
Director, Office of Appropriate Technology.

CROWLEY'S RIDGE DEVELOPMENT COUNCIL, INC.,
Jonesboro, Ark., June 17, 1980.

Hon. DONALD STEWART,
Chairman, Agricultural Research and General Legislation Subcommittee, Agriculture Committee, U.S. Senate, Washington, D.C.

DEAR SENATOR STEWART: I would like the following statement included in the record of testimony given on the Plant Patent Amendments:

Crowley's Ridge Development Council, a community action agency in Northeast Arkansas, is concerned that the Plant Patent Amendments legislation before this subcommittee will, if not eliminate non-hybrid seeds from the market, make it extremely difficult to obtain them. Non-hybrid seeds permit the preservation of seeds for the next year's growth and thereby reduce significantly the costs of home gardening and small truck farming. CRDC is especially concerned with this cost reduction for the nation's low-income families. These families can take a significant step toward self-sufficiency if non-hybrid seeds were readily available to them.

Multinational companies, whose interest is in "cornering" the seed market, are opposed to this desire for self-sufficiency. However, the Agriculture Committee as a whole and your subcommittee, Senator Stewart, should advocate the cause of increased independence for low-income families. Profit margins of large firms will not be measurably injured, and the goal toward which we all strive—to help low-income individuals help themselves—will be more easily realized.

Thank you for your consideration.

Sincerely,

ELIZABETH STAFFORD, *Assistant Planner.*

STATEMENT OF INTERRELIGIOUS TASKFORCE ON U.S. FOOD POLICY

The Interreligious Taskforce is a coalition of national Protestant, Roman Catholic, Jewish, and ecumenical agencies which work together in support of morally responsible U.S. food and development policies at home and abroad. While the Taskforce speaks only for itself, our testimony conforms with the public positions of the major U.S. religious bodies which cooperate in our work. We welcome this opportunity to present our views to the Subcommittee. In our statement, we identify six major areas of concern and make four recommendations.

GENETIC UNIFORMITY

The loss of genetic diversity is undeniably a serious global problem, both because of the vulnerability of single varieties to pests and diseases and because of the

best copy available

resulting decrease in genetic resources needed for plant breeding. Very few people question the gravity of this situation, though disagreements may exist regarding the proper course of action necessary to reverse the trend.

One such disagreement is at issue in this hearing, namely the effect of plant patenting laws on genetic uniformity. Several prestigious bodies, including the National Academy of Sciences and the U.N. Environmental Program, have concluded that there are significant negative effects. Most recently, the Presidential Commission on World Hunger, in its report to President Carter and the American people, concluded that, ". . . seed patenting laws . . . tend to reduce the number of varieties available" and called for "long-range reviews of (seed patenting) laws in light of world food security, conservation, and diversity."

Strangely, the US Department of Agriculture, in testimony before this Subcommittee, did not review any of these reports. Rather, they claimed that the "P(lant) V(ariety) P(rotection) A(ct) does not compel a reduction in market varieties or encourage genetic uniformity." This claim is based merely on the contention that there is "no conclusive study" that proves otherwise. Later in the testimony they add that the Department "views the PVPA as having rather limited effects on genetic vulnerability . . . in part because of the dominance of hybrids . . . in some of our most important crops." One would think that the Department would assume the burden of proof in a major public policy debate over a program in their jurisdiction and offer positive evidence for their position. In fact, however, no review of this ten year old law has ever been undertaken, so guesswork must be relied upon.

Clearly, there is some relationship between plant patenting and the marketing, availability, usage, and preservation of seeds. The important question is not whether the PVPA compels a reduction in market varieties, but whether the direct or secondary effects of patenting encourage, in any way, the trend toward uniformity and, if so, what is the relative importance of patenting as opposed to other causes. This Subcommittee has heard enough evidence that patenting and the resulting patterns of domestic and international seed marketing contribute to the loss of plant varieties to suggest a thorough examination is needed prior to making any changes in the law.

Proponents of the proposed amendments have stressed the potential of patenting to encourage work on new market varieties. However, as has also been pointed out, an increase in the number of new market varieties is not necessarily correlated to an increase in the number of total, genetically distinct, varieties. A careful review of the current requirements of the PVPA is needed to determine if they actually encourage significant gentic differences between varieties, or, as initial evidence suggests, they encourage breeders to concentrate on small changes which fine-tune current varieties to new market trends.

INDUSTRY CONCENTRATION

The rapid rate of concentration within the seed industry has been well documented by several groups appearing before this Subcommittee. Again, very few people seriously dispute the facts of this process of concentration, although there is a good deal of disagreement over whether there is cause for alarm and whether the trend is related to patenting laws.

The Department, in its testimony once again assuringly states that the "PVPA does not compel seed company mergers." The question is, does it provide any incentives to economic concentration? This is not an unimportant question. Anytime the puiblic grants monoploly rights to an individual or to a company through a patent or other means, extreme caution and scrutiny should be exercised. When these monopoly rights are granted to an industry which already exhibits oligopoly pricing power, there is cause for alarm. In such instances, there should be overwhelming public interest reasons for such monopoly grants. In the case of plant patenting these have not been demonstrated.

USDA stresses that individuals and small companies have taken advantage of patenting. Their records, however, show that mearly a third of all patents have gone to just five large companies, with levels of concentration even higher for specific commodities. In summarizing their evidence on this question of who benefits from patenting, the Department states that the PVPA "would seem to make business a bit more attractive for very large firms and at the same time to increase the economic viability of some rather small seed breeding firms." If the plight of the small firm and the need to encourage more private breeders is a priority concern, as USDA implies, then the law could be targeted so as to meet these needs without increasing the market power of oligopolistic firms. Such a strategy deserves serious consideration.

Related to the issue of industry concentration is the issue of the relative balance between private and public sector responsibility for breeding, marketing, and preservation. According to USDA, "PVPA is designed to encourage the private sector to help the public sector develop new and competitive plant varieties." Privately, however, some Department officials say that the underlying strategy is to encourage the private sector to take over nearly all breeding activity, using the results of years of publicly-funded research and development as a starting point. That private interests should reap the benefits of a public investment itself raises important policy questions. In a broader perspective, we agree with the Presidential Commission on World Hunger that the danger exists that "narrow economic, self-interests will be determining the fate of humankind's common heritage—agricultural diversity."

SUSTAINABLE AGRICULTURE

There is widespread agreement that current agricultural practices need to be altered in light new energy realities and continuing unacceptable levels of soil erosion. Plan varieties obviously have an important role to play in this transition to a sustainable agriculture. New varieties would hopefully move in the direction of greater pest resistance, lower energy input requirements, and the like.

Serious conflict of interests problems arise, therefore, with the proliferation of seed company takeovers by agrichemical and energy companies. The practice of marketing seeds and inputs as a package may well have been increased by the availability of patent protection. There is no reason to assume that these firms will act in the public interest when their short-term corporate responsibilities require them to act differently.

PLANT BREEDING STATIONS AND SCIENTIFIC EXCHANGE

As an organization deeply involved in world food problems, we do not take lightly the opposition of many of the plant breeding stations to plan patenting laws. If in any way plant patenting laws discourage the exchange of vital scientific information around the world or limit the exchange of plant materials, they must be seen as a threat to world food security and should be significantly changed or abolished. The fact that some of the world's leading plant scientists raise serious questions about the effects of patenting laws should suggest that their case needs to be heard by the U.S. government before further strengthening US law.

LESS DEVELOPED COUNTRIES

We are especially concerned with the loss of plant varieties in the developing countries, the genetic home of nearly all the world's major food crops. A principal problem encountered in LDCs is the marketing of inappropriate, best-advertised patented varieties of Third World governments and farmers and the resulting disappearance of better adapted as well as wild varieties.

New varieties are also changing the structure of agriculture in many countries. The additional expense for both new seed and agriculture inputs is a cost most small or subsistence farmers cannot afford, at least given present credit and pricing policies. The trend toward uniform varieties across wide areas is drying up supplies of older varieties, pushing those farmers who continue to use localized varieties out of the market, and opening the way for ecological disasters. At the same time, LDC governments often do not have the resources for even minimal preservation programs. If the U.S. preservation program is "in jeopardy because of inadequate facilities and funding" and its collection program "is inadequate considering the rapidity with which germplasm is being lost in its areas of greatest variability" (USDA reports "Special Analysis for Plant Germplasm", June 1980), one can hardly expect governments with far fewer resources to be doing better.

While the temperate countries have always been dependent on the South for germplasm for most major crops, the developing countries are increasingly dependent on Northern Corporations for seeds. In many cases, they must pay royalties for the new varieties, a practice which seems particularly unjust since the resources for these varieties originate in their own countries. At a time when most development specialists are urging greater self-reliance in LDC food and agricultural systems and greater attention to geographical and cultural variations in development programs, this trend toward increasing dependency and uniformity suggests that something is seriously wrong with the status quo.

THE STRUCTURE OF U.S. AGRICULTURE

Insofar as plant patenting encourages the breeding of seeds for the purpose of increasing the mechanical harvesting of fruits and vegetables it has profound implications for the structure of U.S. agriculture and rural areas. Continued work and money being put into this area is contributing to the trends toward larger, fewer farms and increased rural unemployment. At the same time, insofar as plant patenting is contributing to economic concentration within the industry, smaller, regionalized seed companies are being forced out of business. We believe that these are negative trends and we take very seriously the current USDA review of its programs to determine the effects, intended or unintended, on the structure of agriculture and rural communities. The PVPA should be put to the same review.

The goals of plant research and development also relate to broader "food system" issues. For example, the trend toward producing varieties whose principal characteristics is the ability to withstand mechanical harvesting and long transportation or shelf life, with only secondary attention to nutritional value or even taste considerations, needs to be seriously questioned. Careful attention should be given to the research and development goals, implicit or explicit, which are promoted by patent law.

RECOMMENDATIONS

1. We urge the Subcommittee to postpone any action on the proposed amendments to the PVPA until further hearings, analyses, and reports are completed as enumerated below. Following the thorough review of many issues related to the patenting law, decisions can then be made concerning which type of amendments to the PVPA are needed or whether it is best repealed.
2. We urge Congressional oversight hearings be held on the entire PVPA prior to making any judgment as to the validity of the proposed amendments. To our knowledge, no such hearings have taken place during the ten years the law has been in existence. The General Accounting Office and the Office of Technology Assessment might helpfully be asked to prepare reports on these issues. Our six major concerns should be among the topics addressed in those hearings and reports.
3. We urge Congress to ask the Administration for a complete explanation of the costs and benefits of joining the International Union for the Protection of New Varieties of Plants (UPOV). While the amendment designed to facilitate U.S. entry into the UPOV may not be a necessary condition for U.S. membership, we believe that the Department should fully disclose its intentions with regard to the UPOV so that Congress understands the consequences of approving or disapproving seemingly innocuous amendments.
4. We encourage the Chairman of this Subcommittee to seek hearings on some of the broader issues involved in the seed controversy, including, but not limited to, the state of U.S. preservation and collection systems, U.S. efforts in multilateral preservation and collection systems, trends in the number of varieties actually marketed and used as opposed to those stored, U.S. and international response to large crop failures resulting from genetic uniformity, and trends in seed costs. Such a hearing may well shed light on an underpublicized global problem and suggest areas for appropriate additional legislation.

96TH CONGRESS
1ST SESSION

S. 23

To amend the Plant Variety Protection Act (7 U.S.C. 2321 et seq.) to clarify its provisions, and for other purposes.

IN THE SENATE OF THE UNITED STATES

JANUARY 15, 1979

Mr. CHURCH introduced the following bill; which was read twice and referred to the Committee on Agriculture, Nutrition, and Forestry

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A BILL

To amend the Plant Variety Protection Act (7 U.S.C 2321 et seq.) to clarify its provisions, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, **That section 1 (7 U.S.C. 2321) of the Plant Variety Protection Act is amended by striking the words "a bureau" and inserting in lieu thereof the words "an office".**

SEC. 2. Section 5 (7 U.S.C. 2325) of such Act is hereby repealed.

SEC. 3. Section 8 (7 U.S.C. 2328) of such Act is amended by striking the word "officers" and inserting in lieu thereof the word "examiners".

SEC. 4. Section 9 (7 U.S.C. 2329) of such Act is amended by striking the words "published specifications" and inserting in lieu thereof the word "descriptions" and by striking "and a file of such other scientific and technical information as may be necessary or practicable".

SEC. 5. Section 10(a)(1) (7 U.S.C. 2330(a)(1)) of such Act is amended by striking the words "specifications for plant variety protection" and inserting in lieu thereof the words "descriptions of plant varieties protected".

SEC. 6. Section 10(b) (7 U.S.C. 2330(b)) of such Act is hereby repealed.

SEC. 7. Section 10(c) (7 U.S.C. 2330(c)) of such Act is redesignated as 10(b) and is amended by striking the words "the useful arts" and inserting in lieu thereof the words "plant breeding".

SEC. 8. Section 10(d) (7 U.S.C. 2330(d)) of such Act is redesignated as 10(c) and is amended by striking from the second sentence each time it appears the word "specifications" and inserting in lieu thereof the word "descriptions".

SEC. 9. Section 11 (7 U.S.C. 2331) of such Act is amended by striking the word "specifications" and inserting in lieu thereof the word "descriptions".

SEC. 10. Section 31 (7 U.S.C. 2371) of such Act is amended by striking all after the first sentence and inserting the following: "Such fees shall be deposited into the Treasury as miscellaneous receipts. There are hereby authorized to be appropriated such funds as may be necessary to carry out the provisions of this Act."

SEC. 11. Section 52(3) (7 U.S.C. 2422(3)) of such Act is amended by striking the last sentence.

SEC. 12. Section 56 (7 U.S.C. 2426) of such Act is amended by changing the period at the end of the second sentence to a comma and adding the following: "the name of the applicant, and whether the applicant specified that the variety is to be sold by variety name only as a class of certified seed.".

SEC. 13. Section 57 (7 U.S.C. 2427) of such Act is amended by inserting after the phrase "for the publication of" the words "information regarding".

SEC. 14. Section 83(b) (7 U.S.C. 2483) of such Act is amended by deleting the term "seventeen years" in the first sentence and inserting in lieu thereof "eighteen years".

SEC. 15. Section 84 (7 U.S.C. 2484) of such Act is amended to read as follows:

"Sec. 84. Correction of Plant Variety Protection Office Mistake.

"Whenever a mistake in a certification of plant variety protection incurred through the fault of the Plant Variety Protection Office is clearly disclosed by the records of the Office, the Secretary may issue a corrected certificate of plant variety protection, stating the fact and nature of such mistake, without charge. Such certificate of plant variety protection shall have the same effect and operation in law on the trial of actions for causes thereafter arising as if the same had been originally issued in such corrected form.".

Sec. 16. Section 85 (7 U.S.C. 2485) of such Act is amended by deleting "certificate of" from the heading, by inserting before the word "certificate" the second time it appears therein the word "corrected" and by striking the words "of correction in the manner and with attachment of copies as in section 84.".

Sec. 17. Section 91(b) (7 U.S.C. 2501(b)) of such Act is amended by striking the word "specification" in the second sentence and inserting in lieu thereof the word "description".

Sec. 18. Section 93(a) (7 U.S.C. 2503(a)) of such Act is amended by striking the word "specification" and inserting in lieu thereof the word "description".

Sec. 19. Section 127 (7 U.S.C. 2567) of such Act is amended by striking the phrase "the words 'Propagation

Prohibited'" and inserting in lieu thereof the phrase "either the words 'Unauthorized Seed Multiplication Prohibited' or the words 'Unauthorized Propagation Prohibited'".

SEC. 20. Section 128(a)(3) (7 U.S.C. 2568(a)(3)) of such Act is amended by adding the word "either" following the words "propagation prohibited" and inserting in lieu thereof the words "'Unauthorized Seed Multiplication Prohibited' or 'Unauthorized Propagation Prohibited'" and by striking the words "a statement of this basis being promptly filed with the Secretary if the phrase is used beyond testing and no application has been filed".

SEC. 21. Section 144 of such Act is deleted.

96TH CONGRESS
1ST SESSION

S. 1580

To amend the Plant Variety Protection Act to clarify its provisions.

IN THE SENATE OF THE UNITED STATES

JULY 26 (legislative day, JUNE 21), 1979

Mr. TALMADGE (by request) introduced the following bill; which was read twice and referred to the Committee on Agriculture, Nutrition, and Forestry

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A BILL

To amend the Plant Variety Protection Act to clarify its provisions.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Plant Variety Protection Act (7 U.S.C. 2321–2583) is amended by—

(1) striking out in section 1 "a bureau" and inserting in lieu thereof "an office";

(2) repealing section 5;

(3) striking out in section 8 "officers" and inserting in lieu thereof "examiners";

(4) amending section 9 to read as follows:

"Sec. 9. Register of Protected Plant Varieties.

"The Secretary shall maintain a register of descriptions of United States protected plant varieties.";

(5) amending section 10 as follows:

(A) striking out in subsection (a)(1) "specifications for plant variety protection" and inserting in lieu thereof "descriptions of plant varieties protected";

(B) repealing subsection (b);

(C) redesignating subsection (c) as subsection (b) and striking out in subsection (b), as redesignated by this clause, "the useful arts" and inserting in lieu thereof "plant breeding"; and

(D) redesignating subsection (d) as subsection (c) and striking out in the second sentence of subsection (c), as redesignated by this clause, "specifications" each time it appears and inserting in lieu thereof "descriptions";

(6) striking out in section 11 "specifications" and inserting in lieu thereof "descriptions";

(7) striking out everything after the first sentence in section 31 and inserting new sentences as follows: "The fees shall be deposited into the Treasury as miscellaneous receipts. There are hereby authorized to be

appropriated such funds as may be necessary to carry out the provisions of this Act.";

(8) striking out the last sentence of section 52(3);

(9) inserting immediately before the period in the second sentence of section 56 the following: ", the name of the applicant, and whether the applicant specified that the variety is to be sold by variety name only as a class of certified seed";

(10) amending section 57 by inserting "information regarding" after "for the publication of";

(11) striking out in the first sentence of section 83(b) "seventeen" and inserting in lieu thereof "eighteen";

(12) amending section 84 to read as follows:

"Sec. 84. Correction of Plant Variety Protection Office Mistake.

"Whenever a mistake in a certificate of plant variety protection incurred through the fault of the Plant Variety Protection Office is clearly disclosed by the records of the Office, the Secretary may issue a corrected certificate of plant variety protection, stating the fact and nature of such mistake, without charge. Every such corrected certificate of plant variety protection shall have the same effect and operation in law as if the same had been originally issued in such corrected form.";

(13) amending section 85 as follows:

(A) striking out in the heading "Certificate of";

(B) striking out in the first sentence "certificate of correction in the manner and with attachment of copies as in section 84," and inserting in lieu thereof "corrected certificate"; and

(C) amending the second sentence to read as follows: "Every such corrected certificate of plant variety protection shall have the same effect and operation in law as if the same had been originally issued in such corrected form.";

(14) striking out in the second sentence of section 91(b) "specification" and inserting in lieu thereof "description";

(15) striking out in section 93(a) "specifications" and inserting in lieu thereof "descriptions";

(16) striking out in section 127 "the words 'Propagation Prohibited'" and inserting in lieu thereof "the phrase 'Unauthorized Seed Multiplication Prohibited' or the phrase 'Unauthorized Propagation Prohibited'";

(17) amending section 128(a)(3) to read as follows:

"(3) Use of the phrase 'Unauthorized Seed Multiplication Prohibited', 'Unauthorized Propagation Pro-

hibited', or similar phrase without reasonable basis. Any reasonable basis expires one year after the first sale of the variety except as justified thereafter by a pending application or a certificate still in force."; and

(18) repealing section 144.

II

96TH CONGRESS
2D SESSION

S. 2820

To amend the Plant Variety Protection Act to clarify its provisions, and for other purposes.

IN THE SENATE OF THE UNITED STATES

JUNE 12 (legislative day, JANUARY 3), 1980

Mr. MELCHER (for himself and Mr. CHURCH) introduced the following bill; which was read twice and referred to the Committee on Agriculture, Nutrition, and Forestry

---

A BILL

To amend the Plant Variety Protection Act to clarify its provisions, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Plant Variety Protection Act (7 U.S.C. 2321–2583) is amended by—

(1) striking out in section 1 "a bureau" and inserting in lieu thereof "an office";

(2) repealing section 5;

(3) striking out in section 8 "officers" and inserting in lieu thereof "examiners";

R

(4) amending section 9 to read as follows:

"Sec. 9. Register of Protected Plant Varieties.

"The Secretary shall maintain a register of descriptions of United States protected plant varieties.";

(5) amending section 10 as follows:

(A) striking out in subsection (a)(1) "specifications for plant variety protection" and inserting in lieu thereof "descriptions of plant varieties protected";

(B) repealing subsection (b);

(C) redesignating subsection (c) as subsection (b) and striking out in subsection (b), as redesignated by this clause, "the useful arts" and inserting in lieu thereof "plant breeding"; and

(D) redesignating subsection (d) as subsection (c) and striking out in the second sentence of subsection (c), as redesignated by this clause, "specifications" each time it appears and inserting in lieu thereof "descriptions";

(6) striking out in section 11 "specifications" and inserting in lieu thereof "descriptions";

(7) striking out everything after the first sentence in section 31 and inserting new sentences as follows: "The fees shall be deposited into the Treasury as miscellaneous receipts. There are hereby authorized to be

appropriated such funds as may be necessary to carry out the provisions of this Act.";

(8) amending subsection (a)(2) of section 42 to read as follows:

"(a)(2) The variety was offered for sale or sold by the owner or his privies, in a foreign country, for longer than four years before the effective filing date of the application therefor or, in the case of woody plants, for longer than six years before that date.";

(9) striking out the last sentence of section 52(3);

(10) inserting immediately before the period in the second sentence of section 56 the following: ", the name of the applicant, and whether the applicant specified that the variety is to be sold by variety name only as a class of certified seed";

(11) amending section 57 by inserting "information regarding" after "for the publication of";

(12) striking out in the first sentence of section 83(b) "seventeen" and inserting in lieu thereof "eighteen";

(13) amending section 84 to read as follows:

"Sec. 84. Correction of Plant Variety Protection Office Mistake.

"Whenever a mistake in a certificate of plant variety protection incurred through the fault of the Plant Variety

Protection Office is clearly disclosed by the records of the Office, the Secretary may issue a corrected certificate of plant variety protection, stating the fact and nature of such mistake, without charge. Every such corrected certificate of plant variety protection shall have the same effect and operation in law as if the same had been originally issued in such corrected form.";

(14) amending section 85 as follows:

(A) striking out in the heading "Certificate of";

(B) striking out in the first sentence "certificate of correction in the manner and with attachments of copies as in section 84," and inserting in lieu thereof "corrected certificate"; and

(C) amending the second sentence to read as follows: "Every such corrected certificate of plant variety protection shall have the same effect and operation in law as if the same had been originally issued in such corrected form.";

(15) striking out in the second sentence of section 91(b) "specification" and inserting in lieu thereof "description";

(16) striking out in section 93(a) "specifications" and inserting in lieu thereof "descriptions";

(17) striking out in section 127 "the words 'Propagation Prohibited'" and inserting in lieu thereof "the phrase 'Unauthorized Seed Multiplication Prohibited' or the phrase 'Unauthorized Propagation Prohibited'";

(18) amending section 128(a)(3) to read as follows:

"(3) Use of the phrase 'Unauthorized Seed Multiplication Prohibited', 'Unauthorized Propagation Prohibited', or similar phrase without reasonable basis. Any reasonable basis expires one year after the first sale of the variety except as justified thereafter by a pending application or a certificate still in force."; and

(19) repealing section 144.

SEC. 2. Section 501 of Federal Seed Act is amended to read as follows:

"SEC. 501. It shall be unlawful in the United States or in interstate or foreign commerce to sell or offer for sale or advertise by variety name seed not certified by an official seed certifying agency when it is a variety for which a certificate of protection issued under the Plant Variety Protection Act specifies sale only as a class of certified seed: *Provided*, That seed from a certified lot may be labeled as to variety name when used in a mixture by, or with the approval of, the owner of the variety.".

STAFF EXPLANATION OF S. 23, S. 1580, AND S. 2820

All three bills—S. 23, S. 1580, and S. 2820—would amend the Plant Variety Protection Act to refine and update the terminology so that it may be more easily understood by individuals using the Act; to allow publication of the name of the applicant and whether the applicant specified that the variety is to be sold by variety name only as a class of certified seed; and to alter its provisions to be in accord with the International Union for the Protection of New Varieties of Plants (UPOV).

A bill similar to S. 23 was originally introduced at the request of the Department of Agriculture in the 95th Congress. Senator Church and others reintroduced the bill in the 96th Congress.

The Department submitted a new bill in the 96th Congress that Senator Talmadge introduced. This bill, S. 1580, is virtually the same as S. 23, but there are a few minor refinements to sections 15, 16, and 20 of S. 23.

S. 2820 was introduced by Senator Melcher and Senator Church. S. 2820 is exactly the same as S. 1580 with two additions that were previously requested by the Department. One addition would eliminate a remaining conflict between the Plant Variety Protection Act and the UPOV. The second addition would bring the language of the Federal Seed Act into conformity with the Plant Variety Protection Act.

[NOTE.—The Plant Variety Protection Act, approved December 24, 1970, as Public Law 91-577, authorized the establishment of a Plant Variety Protection Office in the Department of Agriculture. This office issues "certificates of plant variety protection" to assure developers of novel varieties of sexually reproduced plants exclusive rights to sell, reproduce, import or export such varieties, or use them in the production of hybrids or different varieties, for a period of 17 years.]

HARVARD UNIVERSITY,
SCHOOL OF PUBLIC HEALTH,
Boston, Mass., June 10, 1980.

SENATE AGRICULTURE SUBCOMMITTEE ON RESEARCH,
Washington, D.C.

DEAR SENATORS: I request that this letter be taken as testimony on the Plant Variety Protection Act.

I am writing you to express my concern over proposed amendments to the Plant Variety Protection Act:

(1) A sound national and international germ plasm policy for crops should begin by recognizing the dual needs for diversity and progress. Historically, diversity arose from the planting of crops in many localities, the selection of seed from successful plantings, exchange among farmers locally. The local races adapted to different conditions providing the raw material for more self-conscious plant breeding. Improved varieties when distributed widely can cross with local varieties, adapt, and diversify. This cycle of local selection, diversification, collection, scientific selection and redistribution has been disrupted by the increased commercialization of seed which has accelerated the central, scientific phase at the expense of variation. The PVPA did not cause this, but will certainly make it worse: (a) by promoting greater concentration of ownership, greater sales efforts penetrating all corners of the world; (b) imposing legal restrictions on local selections and exchange starting from commercial varieties; (c) linking seed with a technical package which is accessible mostly to the affluent who can have the machinery, fertilizers, pesticides, etc. This will promote land concentration as well.

Rather than promote this concentration of plant breeding and genetic depletion, we should encourage the preservation of local varieties, the integration of sophisticated plant breeding from world germ plasm collections and local variation making use of farmers' own practices, knowledge and intelligence.

2. An ecologically sound strategy would promote the use of multilines and heterogeneous gene pools which could provide a buffer against uncertainty and make good use of microclimate variation. But such genetic heterogeneity would be lost in the attempt to have definable, bounded, patentable varieties.

3. Since the cost of development of varieties can be very great, the predominant strategy of plant breeding by large corporations would be to aim at varieties which could be grown over the widest geographic range but within narrow technological options, to be furnished by the same company. Thus development of local varieties adapted to the needs of the less affluent will suffer.

4. The role of the USDA plant breeding programs will be altered: large companies would like the USDA either to get out of breeding altogether (so as not to compete with the private sector) or to provide a few basic genes, release them early, and let the

companies with more facilities turn the genes into varieties. Insofar as they are successful, they will dominate research, and impose an every narrowing short-range pragmatism on a field never characterized by farsightedness.

5. The need to differentiate varieties will encourage "chrome and tailfin" of seed breeding; selection of traits for identifications will increase.

There is one saving grace in this legislation: it will prove unworkable.

(a) Variation is a law of nature. In every generation each seed or pollen grain will contain anywhere from 1 to 100 new mutations in a genome of 100,000 to 1 million genes. And if only 10 loci are segregating, practically every plant will be some unique combination.

(b) Varieties really contain hidden variations despite their apparent uniformity. This hidden diversity shows up under unusual conditions. The production and maintenance of a well-defined variety should prove impossible.

(c) For cross-pollinated species, genes from one variety will constantly get into other varieties. This is not undesirable, but will interfere with the maintenance of boundaries unless a morass of bureaucratic constraints are imposed and bees can have their flying licenses cancelled for promoting miscegenation.

As a population ecologist and geneticist, I would urge that the U.S. Congress no more attempt to control plant evolution than legislate the value of π in πr^2. It would be absurd, harmful, unworkable, and lead to endless litigation.

Sincerely yours,

RICHARD LEVINS,
John Rock Professor of Population Sciences.

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